JUN 9 1941

ELECTRICAL REVIEW

FOUNDED 1872

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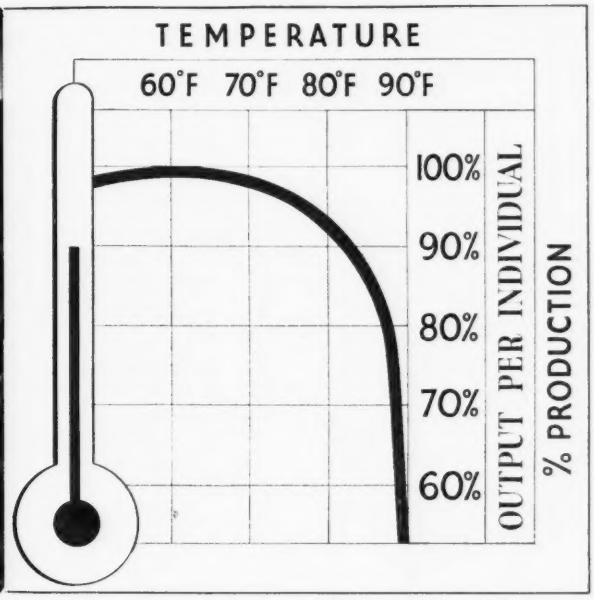

AS TEMPERATURES RISE... PRODUCTION FALLS

The problem of artificial ventilation in factories engaged upon work of national importance, particularly where they are permanently blacked out, is one that must be energetically tackled and solved if output is not to be retarded during the summer months. Proper provision must be made as well, for re-built factories and those that have not so far reached the constructional stage.

G.E.C. ventilating engineers gained vast experience in urgent schemes of last summer, and their experience is at the disposal of all who require expert advice.

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It is not often that an industrial concern mentions an order that it refused to execute, but we believe that readers may be interested to hear of such an instance.

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We now learn that the Italians tried every ruse to obtain supplies of "Bitumastic" with which to complete their repairs and they sent as their first emissary a Spaniard who had been engaged in the repair work.

Our agent at Tangier, knowing the Spaniard, asked him for his word of honour that the Solution would not be used on the Italian vessels. This the Spaniard refused to give, and the two containers of "Bitumastic" that he had taken away in his car were returned on the following day.

There followed a procession that had a League of Nations air about it. An Italian of the Tangier Administration came to try and buy the Solution, but was sent away empty-handed. Next came a Frenchman, and finally another Spaniard, but they had no better luck.

The repaired Italian submarine eventually departed—minus their protective coating of "Bitumastic" Solution. Our agent adds that the good qualities of "Bitumastic" products are so well known in Tangier that there is a constant demand for them. We are always happy to supply our customers—but we draw the line at enemy submarines!

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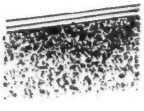

Here's a good war story—and a true one. For 86 years we have waged relentless war against corrosion with "Bitumastic" or others of our special anti-corrosion preparations. Evidence of our victories may be seen in all quarters of the globe. Little wonder, therefore, that our enemies eagerly sought an ally so successful. But they didn't get the "Bitumastic" they so sorely needed . . . and so for the first time in our history we are pleased to leave corrosion, rot and decay to do their worst.

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DEFEAT CORROSION

Incidentally the article reproduced here is from "The Protector," our House Journal, which is full of interesting reading. May we send you a copy? Write to Dept. L.3. Just say "March issue of 'The Protector' please."

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THE
ELECTRICAL REVIEW

Volume CXXVIII **No. 3315**

Friday, June 6, 1941

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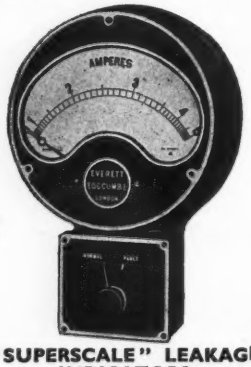

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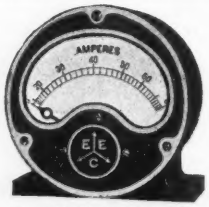

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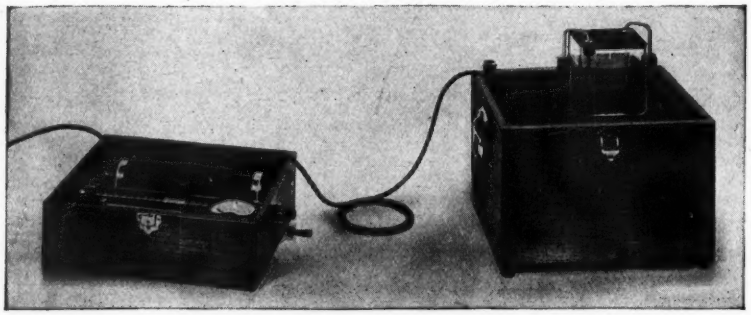

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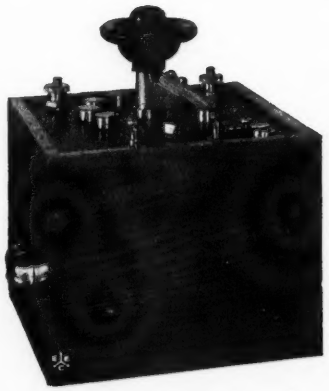

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THE
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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVIII. No. 3315 JUNE 6, 1941 Price SIXPENCE

Looking Ahead

Engineers Must Share in Planning

INSISTENT as are the demands of the moment on our energies during all our working hours, time must nevertheless be found somehow to prevent an outcome that would be only less calamitous than any failure of the main war effort. It would be a disaster if the end of the war found us unprepared to face the problems of peace in a world which will be different in many ways from that we have known. Whether it will be better or worse depends very largely on engineers, and the cessation of hostilities will bring little easing of their responsibility towards furthering the national welfare.

Forethought Better Than Improvisation

Engineers enjoy more than their fair share of delight in exercising a talent for improvisation that is sometimes regarded as typically English, but this may be just a form of self-indulgence and, as recent events have shown, it can no longer be regarded as a substitute for scientific planning—after all, only another name for using forethought. A flair for improvisation will find scope enough in adapting broader schemes to local circumstances.

Views as to the desirability of planning ahead should not be prejudiced by notorious examples of the perversion of the principle to evil ends or by the ineffectual nature of the attempts of many amateurs, who are more on the side of the angels, to draw up schemes the only merit of which is their tidiness. Engineers can work against a background of experience and expert knowledge in many essential directions and for the larger issues their training, which disposes them to seek the causes of every effect, should be of inestimable value.

Thought and discussions about the future also help to clarify one's views of what is really desired and to give them constructive shape. Too often has the electrical industry been reproached, with some justice, of being unable to make up its mind on some matter of public importance in which it is vitally concerned, and then complaining because some scheme has been imposed upon it from outside.

The good attendance at the informal evening meeting last week of the Institution of Electrical Engineers, which was allocated to a discussion of the shape of things to come, seemed to indicate that members have readily fallen in with the earlier suggestion of the President, Mr. J. R. Beard, that consideration of the electrical future might well form a suitable occupation for periods of relaxation from the more strenuous and urgent work of the day.

In order that engineers may play their part fully in a world that is becoming increasingly technological, they must claim their privilege to do so in far more peremptory fashion than they have in the past. The most effective way is through group representation. In setting up a Post-War Planning Committee, the I.E.E. has taken the appropriate step. The potential value of this move has received encouraging recognition from the Minister of Works and Buildings, Sir John Reith, who was himself trained as an engineer. It is to be hoped that the other senior engineering institutions will adopt similar measures and arrange for concerted action, when needed, with the I.E.E., as the greatest weight would, no doubt, be attached by the public to the declared views of a joint body which was known to represent the views of engineers as a whole.

The Individual's Part

The functions of the I.E.E. Committee are, however, limited by the terms of its Royal Charter and it would act as an advisory body only when asked to do so. A large proportion of the wider social implications of modern technical problems would be outside the scope of its powers of initiative. In any case individual engineers cannot devolve their entire responsibilities on to a committee. The onus is still upon them to interest themselves as citizens in ensuring that the profession and industry, in which they not only make their livelihood but also find their main opportunities for giving expression to their social instincts, shall serve the public in the most thorough-going manner.

In opening the discussion at the Institution the President indicated several lines of thought. Three important issues relate to finance, distribution of population and the continuance of the system of controls established as a war measure. The last-named would have compensating advantages if it proved a way out for the electrical industry from the maze of practices (including unnecessary deviations from recognised standards and also the existence of too many standards) that are generally agreed to be undesirable, but which it is nobody's business to "liquidate." Cutting out the

dead wood may be as important as the introduction of improved technique. It would certainly be in the interests of users of electricity, the exhaustive study of whose needs is a condition of electrical progress.

Modern Factory Lighting

IT has taken the present urgent need to increase output and to conserve the health of workers for full recognition to be given to the importance of providing adequate lighting in industry by making certain minimum standards obligatory. This tardiness is no doubt due, as Sir Duncan Wilson said (from his experience as former Chief Inspector of Factories) on opening the E.L.M.A. exhibition last week, to the ill effects of defective lighting not being immediately felt by the operatives; yet it is often the incipient cause of lost time. A visit can be recommended to factory managers, works electrical engineers, and welfare officers, as it will enable them to study lighting problems under practical conditions with the aid of expert advice.

More Electric Kettles

THE events of the past few months have considerably increased the demand for electric kettles and at the same time the supply has been seriously curtailed by the Limitation of Supplies Order, the shortage of materials and damage to manufacturers' works. The Electrical Development Association has interested itself in the matter, and has made representations to the authorities as a result of which the Non-Ferrous Metal Control has agreed to release copper and brass for replacement elements and for elements to be fitted in kettle bodies of non-ferrous material. Some makers have produced kettles with bodies of porcelain, enamelled iron and tinplate, in some cases with a beneficial effect upon the price of the appliances.

Rationing Form Expenses

WE have already recorded the endeavours of electricity supply authorities to persuade the Mines Department to reimburse them for the expense they were put to in preparing forms for the abortive electricity rationing scheme and the Department's reluctance to "stump up." It now appears as though that attitude has changed for we observe in recent accounts of the Stoke Newington Electricity Committee an item "Mines Department—Completion of Old Forms, £30 18s. 1d."

Overhead Cables

EXPERIENCE gained by the Philadelphia Electric Co. during several months' experience of nearly five miles of 4,000-V cables run on poles without catenary support provides the subject of a recent paper presented by Mr. S. H. Troxel before the Pennsylvania Electric Association. These appear to have given very satisfactory results and, while involving greater initial expense than the bare conductor construction, they are shown to offer appreciable advantages, now that initial difficulties with fittings such as splicing clamps have been surmounted. The system finds most scope in wooded districts where the necessity for tree trimming is obviated and supplies have been maintained even when storm-felled trees have knocked over the poles.

The Nucleus

PERHAPS the next great step forward in physics will be due to knowledge derived from exploring the nucleus of the atom, in which is stored most of the atomic energy. Considerable hopes that the next few years will bring us possibly epoch-making developments in this direction are based on the design by Professor E. Lawrence of the University of California of a cyclotron very many times more powerful than any hitherto constructed. An account of the principles and practical bearing of the cyclotron—the most promising method of disintegrating the nucleus by speed bombardment with atomic particles—was given by Dr. T. F. Wall in our issue of July 8th, 1938. Although the ultimate effects on engineering practice of opening up so fruitful a field for exploration in physics literally cannot be envisaged at this stage, it may be accepted that they will be of great significance.

"Recent Testimonials"

APPLICANTS for situations have recently sent letters to this journal complaining of the impossibility of fulfilling the advertisers' requirement of a number of recent testimonials. They have pointed out that an applicant may have been in one job for many years so that the production of more than one recent testimonial is out of the question. They may be thankful that they are engineers and not medical men. We have noticed an advertisement in *The Times* of a hospital post in which not only are recent testimonials called for but thirty copies too—in these days of paper starvation! It is also worth noting that the same advertisement also states that the present assistant is applying for the job, an example which might often be followed in electrical circles as an indication of the possibilities.

The Other Fellow

SOME people do not mind what happens so long as it doesn't happen to them, and they are apt to advocate compulsion for everybody but themselves. In a recent article a building industry paper considers that "railways, like electricity, are ripe for nationalisation." But it goes on to say: "If the all-in nationalisers get their way, the future Britain will have no place for private builders" and the writer comes to the conclusion that "intelligent change will require the nationalisation of some industries, but building is not one of them." Without entering into a discussion of the desirability or otherwise of nationalisation, we may perhaps be permitted to remark that houses are as necessary as electricity and that larger profits are made out of the public by builders than the railway companies or electricity suppliers were ever allowed to make.

Post-War Exports

THE difficulties which will be experienced in re-establishing our overseas markets after the war were referred to by Mr. W. J. Terry at the annual meeting held last week of the London Electric Wire Co. & Smiths, Ltd. Countries which previously took a large part of our exports are developing their secondary industries and will thus, in a greater measure, become self-supporting. Mr. Terry considers that this and other problems which post-war conditions will create should be met by careful and collective planning. He is of opinion, however, that the continuance of the existing control of industry after the war will not solve these problems and will only tend to hamper initiative.

Unwanted Allies

THE appeal to the Government by a group of M.P.s to secure postponement of consideration of the Grampian Company's scheme for the development of further Scottish water-power has been acclaimed by opponents of the scheme who welcome any allies in their fight against it. But it seems that complications are arising and that the interest of these Members in the subject is not quite on the right lines. Their suggestion that the matter is one which should be left for consideration by the proposed Central Planning Authority is stated by a correspondent to a Scottish paper to be merely a desire that there shall be a wholesale development of Scottish water-power (with accompanying ruin of amenities) for the benefit of the South. He sees no beauty in the prospect of high-voltage lines out of Scotland into England.

Renewing Bombed Apparatus

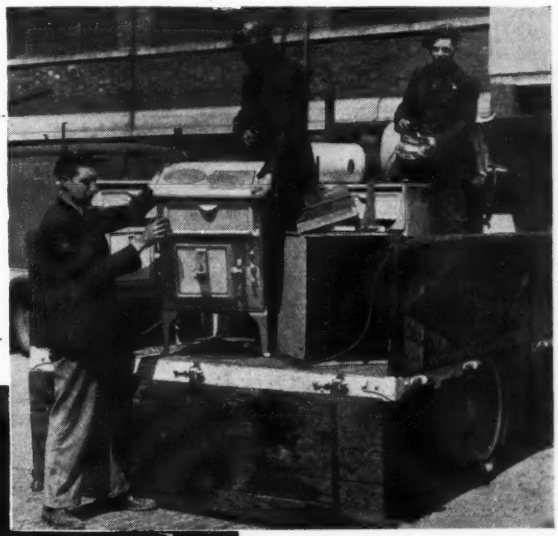
London Borough Supplies Appliances to Evacuation Areas

AMONG many problems which the Luftwaffe's indiscriminate bombing of residential property has created or accentuated for electricity supply undertakings is the question of supplying and maintaining sufficient quantities of domestic electrical apparatus to meet demands. Owing to the general discovery that electricity furnishes the most convenient and most readily installed means of providing emergency lighting, heating, cooking and ventilation as well as many other services, there has in any case been a tremendous increase in the demand for equipment. Coupled with this is the fact that the Limitation of Supplies Order, the scarcity of certain raw materials and the general concentration of electrical manufacturers on products of more vital importance to the war effort, have all combined to reduce the output of appliances, not to mention replacement parts.

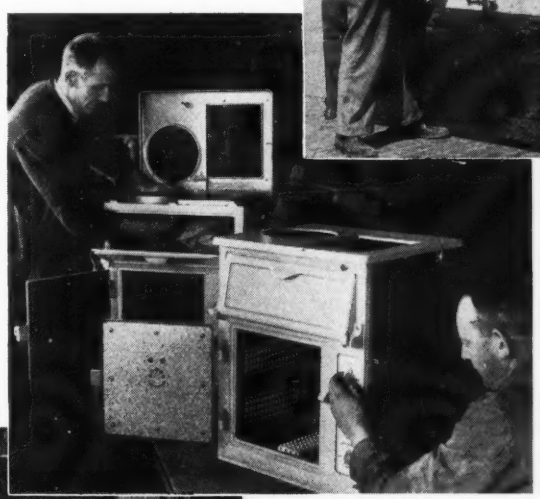
The Poplar Electricity Department is not only repairing appliances for its own consumers but also helping to remedy the shortage in other areas

The putting out of action, therefore, of large numbers of appliances by bombing greatly emphasises the difficulties and renders the possession of an efficient repair and maintenance department more and more essential if an undertaking's service is not sooner or later to become seriously impaired. The position of an undertaking with regard to stocks and replacements does, of course, vary very considerably according to the district, to whether it is a reception or evacuation area, and to the extent of the enemy's attention. Some undertakings, too, bought up large stocks of apparatus when the war first began. However that may be, as the war proceeds the need for repairing and returning to service every available piece of apparatus will make itself increasingly obvious. Co-operation between undertakings whose requirements of apparatus have changed is also likely to play a larger part in securing that every good piece of apparatus is in an area in which it can best be utilised.

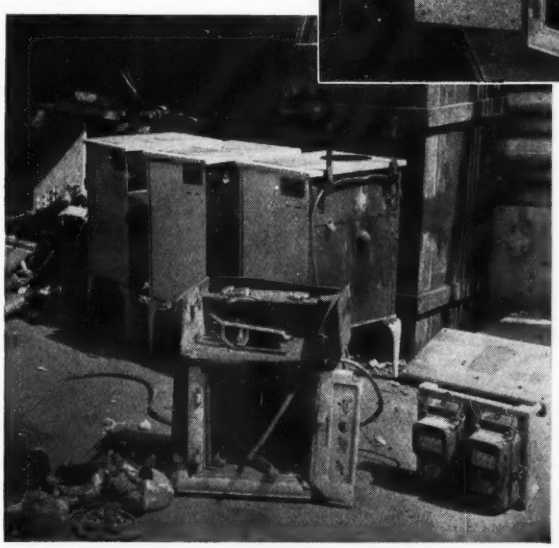
Such schemes of co-operation are, in fact, already in force in several cases. A few days ago we were taken to see how one London borough, Poplar, which has suffered substantial damage to its stocks of domestic apparatus, is succeeding not only in renovating and keeping in good condition equipment for use in the borough, but is also reconditioning large quantities of damaged cookers, etc., which are now surplus to its requirements, owing to evacuation, for use by other undertakings.



A lorry-load of damaged apparatus arrives at the Poplar repair shops



Assembling reconditioned cookers



Damaged apparatus awaiting treatment

Even before the war the Department's repair shops were kept busy dealing with routine repairs relating to all types of apparatus. With the advent of bombing a much greater strain has been placed on resources and it has been necessary to increase the number of employees to deal with the situation. With these improved facilities, apart from handling all the usual service jobs, it is possible to turn out about thirty-six cookers a week "as good as new," as well as considerable quantities of other appliances, for "export" to other undertakings. Already many hundreds of these appliances have been so disposed of since reconditioning was begun in January, but the demand is still very much greater than the supply.

When the apparatus is removed from bombed premises, it is stored until required at one of several substations. Never more than two hundred appliances are kept on one site; this dispersal minimises the risk of large quantities of appliances being damaged by one "incident." From these stores equipment is taken to the repair shops as required. All the apparatus removed from bombed areas is not damaged, of course, though almost without exception it is found that complete stripping down and cleaning is necessary,

and the replacement of minor components is also needed.

It is somewhat difficult to give a fair figure for the proportion of apparatus that it is possible to render serviceable out of a given quantity. In the first place "good" parts from several pieces of apparatus are combined to make a complete unit and many otherwise complete appliances are, perhaps, held up for the lack of some small components such as door springs, thermostats, etc. Furthermore, according to present practice it is inevitable that the least damaged units should be selected from the stores for repair first. So far, however, it can be said that approximately 60 per cent. of the apparatus dealt with has been returned to service in first-class condition.

A water heater and a fire undergoing repair

Of course, all components of appliances are not equally liable to sustain damage and need replacement. Cooker hotplates do not stand up well to lying about perhaps for weeks, exposed to damp, and of one hundred it will probably be found that there are thirty usable ones. Of these, few of them may be in sufficiently good condition to "export," though they will still give good service on the Department's own cookers. We are informed that to overcome this hotplate difficulty the undertaking will probably be doing some of the rewiring itself before long.

Compared with hotplates the grill-boilers appear to be much hardier. They do not deteriorate through exposure to any extent, but they are liable to get knocked about. Any loose part of an apparatus of use by itself seems to disappear miraculously: this phenomenon is also noticeable in the case of the coin boxes of prepayment meters. However, even if they are still in the cookers, oven tins usually need replacement, the figure being put as high as 95 per cent. On the other hand only about 5 per cent. of the runners and shelves need to be replaced, though many of them are found to require re-enamelling or replating.

The actual reconditioning process for cookers follows much the same lines as those adopted generally by most apparatus repair depôts. On arrival at the repair shops a general inspection is carried out to see what treatment is necessary. At this stage all removeable components such as hotplates, grill-boilers, interiors, shelves, runners, splash plates, legs, busbars, etc., are removed (all the parts from one cooker being tied together) and their reconditioning commenced separately, so that a stock can quickly be built up of articles likely to be most in demand. All the metal parts are soaked in "Basol" to remove caked-on grease, dirt and rust.

The ovens themselves are stripped right down. The loose parts which are not too dirty or badly damaged are also treated in "Basol," while the packing is inspected to see whether it needs replacing: unless the latter has been damaged by water this is seldom necessary. One of the faults which most commonly develops as a result of bombing is in the wiring, and the firebar formers of the heating elements also have a tendency to crack under the strain.

After treatment in "Basol" enamelled or plated components in good condition are buffed up, while those which show themselves the worse for wear are vitreous enamelled, sprayed or replated locally. Although as already mentioned the Department is contemplating rewiring hotplates itself they are at the present time returned to the manufacturers for repair.

When the cleaning and finishing of the parts are completed, the cookers are reassembled, adjusted and tested. It is a fact that, besides being almost indistinguishable from new they may actually be better in some respects from the mechanical point of view, since each unit receives individual attention. The doors, for instance, are made to fit better: incidentally it is important to retain the original doors wherever possible as each differs very slightly from its fellows. The fitting of the elements, too, offers scope for improved adjustment. In general much the same method of treatment is adopted for other types of apparatus such as fires, washboilers, water heaters, kettles, etc.

Supplying Civil Defence Services

Besides supplying apparatus to other undertakings the repair shops have been very much occupied in providing considerable numbers of appliances to meet the special requirements of the various Civil Defence Services, as well as on occasion the Pioneer Corps. The latter body recently sent an urgent appeal for six cookers to be installed within twelve hours so as to be able to feed between three hundred and four hundred men—and they got them.

Well over a hundred large cookers, too, have been supplied for rest centres, Londoners' Meals Service Centres, and all A.R.P., A.F.S. and ambulance services in the borough. Radiators and kettles have been installed in every wardens' post, and it is hoped to have all the large trench shelters equipped soon with wash boilers and hotplates for the purpose of providing hot water and hot meals such as soups, stews, etc., in addition to the heating installations. The London County Council also has taken over several reconditioned water heaters.

A general view of the Poplar Electricity Department's apparatus repair department

We wish to thank Mr. R. Illingworth, chief engineer to the Poplar Electricity Department, for giving us permission to inspect this interesting and useful side of his undertaking's work.

Silvering Non-Metallic Surfaces

IT does not seem to be generally appreciated that coatings of silver can be electro-deposited on non-metallic surfaces other than glass, such as moulded plastics and celluloid, including mica. The possibilities of such deposits as a basis for metallisation were discussed in a paper by Dr. J. R. I. Hepburn, which was presented at the final meeting to be held this session in London by the Electro-Depositors' Technical Society.

Adhesion and thicknesses of such deposits were dealt with and thickness measurements recorded, the paper being accompanied by practical demonstrations of three well-established processes, the formulæ for which were set out in the paper. The author referred to applications of these processes to the production of precision instruments (micro-fuses) as well as to all-metal parabolic reflectors, "armoured" glass vessels and heliograph mirrors.

PERSONAL and SOCIAL

News of Men and Women of the Industry

WE have only just learned, from an American source, that **Mr. W. E. Bush,** who was very prominent and popular in the lighting industry here for many years (he founded the E.L.M.A. Lighting Service Bureau), was interned when the Germans over-ran France a year ago. Mr. Bush was in Paris in charge of the European interests of Curtis Lighting, Inc., Chicago.

Mr. William Easton, A.M.I.E.E., has been appointed by Falkirk Corporation to the post of deputy electrical engineer and manager of the burgh Electricity Department. Mr. Easton, who is 37 years of age, is a B.Sc. of Edinburgh University. For the last five years he has been in the service of Central London Electricity, Ltd., lately as mains engineer for the West Central area. He had previous experience with the Edinburgh and Manchester Corporations and with the North-Eastern Electricity Supply Co.

Mr. A. B. Holmes, London branch manager of Siemens Electric Lamps & Supplies, has retired after fifty-one years' service with Siemens. Mr. Holmes joined Siemens Bros. & Co., Ltd., Woolwich, as a junior in 1889, and has been manager of the London branch of the Lamp Co. for the past fifteen years. He has been presented with the Encyclopædia Britannica in a walnut bookcase by Dr. H. R. Wright (managing director) on behalf of his friends at Woolwich, Caxton House, Upper Thames Street, Preston and Dalston, and a gift of a wristlet watch for Mrs. Holmes. The branch managers have presented Mr. Holmes with a set of bowls in a leather case, and the London sales representatives have given him a gold wristlet watch.

Mr. A. B. Holmes

Mr. J. E. Robertson, chief administrative assistant in the Hackney Electricity Department, was recommended by the Bradford Electricity Committee for the position of commercial manager of the city's Electricity Department. We regret to hear, however, that he has been unable to take it up on medicagrounds, and the Committee therefore recommends that **Mr. F. Evans,** supply accountant, Stepney Electricity Department, shall be given the appointment. There were nearly sixty applicants for the Bradford post which carries a salary of £800, rising to £950.

Mr. G. H. Squire has been appointed manager of the Southampton branch at Dickerson Place, Coleman Street, Southampton (Tel.: 4539) of W. T. Henley's Telegraph Works Co., Ltd., in succession to **Mr. C. W. Pennett,** who is leaving the company's service.

Mr. E. F. Humphrey, mains superintendent to the Chester Corporation Electricity Department, has resigned because of ill-health. The Corporation Electricity Committee has appointed **Mr. D. Keeling,** of Wallasey, as chief clerk and cost accountant at a salary of £320 per annum.

We hear from **Mr. A. N. D. Kerr,** A.M.I.E.E., that he is now serving as a lieutenant in the Royal Army Ordnance Corps. Although his company (the Andykar Electrical Co.) is still being carried on as a trading concern it is not in a position to continue manufacturing during the war.

Capt. E. J. Grout, R.A.O.C., was recently married at Hayes (Kent) to **Miss Diana Addison.** Before volunteering for the Army Capt. Grout was with the Hammersmith Borough Council, and prior to that was engineering assistant to Mr. W. G. Trend, borough electrical engineer of Bromley. His bride was also on the staff of the Bromley undertaking until her marriage.

Mr. J. Rowan, who upon relinquishing the general secretaryship of the Electrical Trades Union has also retired from the N.J.I.C. for the Electricity Supply Industry. He was recently entertained to luncheon by his Council colleagues who presented him with a cheque. Mr. Rowan is succeeded as chairman of the employees' side by **Mr. H. P. Bolton.**

T. Clarke & Co., Ltd., have appointed **Messrs. H. A. J. Kenneth, J. E. Hainsworth** and **J. V. Astley,** members of their staff, as directors of the company.

Mr. C. A. Ritchie, chief engineer of the collieries in the Consett Iron Co.'s group, has been elected President of the North of England branch of the Association of Mining Electrical Engineers. **Mr. H. Pritchard,** electrical engineer in the Aberdare Valley for the Powell Duffryn Associated Collieries, was elected president of the South Wales branch of the Association at the recent annual meeting held at Porthcawl. **Mr. V. P. Mackay** has been elected president of the Lothians Branch of the Association and Messrs. G. A. McLennan and J. Frame vice-presidents.

I.E.E. Council Nominations.—The following nominations by the Council of the Institution of Electrical Engineers for the 1941-42 session are announced:—President, Sir Noel Ashbridge (chief engineer, B.B.C.); vice-president, Professor S. Parker Smith, D.Sc. (Royal Technical College, Glasgow); hon. treasurer, Mr. E. Leete (London Electric Wire Co. & Smiths, Ltd.); ordinary members of Council, Lt.-Col. S. E. Monkhouse (North-Eastern Electric Supply Co.), Mr. F. Parkinson (Crompton Parkinson, Ltd.) and Mr. S. E. Goodall (Research Dept., Metropolitan-Vickers Electrical Co., Ltd.).

Mr. E. O. H. Thompson informs us that he has resigned from his position as head of the Technical Lighting Department of Crompton Parkinson, Ltd. He has been with the company for six years and was previously with Holophane, Ltd., for twelve years. He is the son of Mr. H. Hepworth Thompson, late managing director of Holophane, Ltd.

Mr. P. V. Hunter, C.B.E., has consented to serve for the third consecutive year as president of the Electrical Industries Benevolent Association. He hopes to welcome many members and friends at the Association's annual luncheon on June 17th.

Mr. W. W. Grimes has been appointed assistant mains superintendent in the Chesterfield Electricity Department.

Mr. Wilfred E. Redfern has retired from the chairmanship of Redfern's Rubber Works, Ltd., a business which he founded in 1900. He is succeeded by his youngest brother, **Mr. J. Arthur Redfern** and his son **Mr. Thomas H. Redfern** becomes deputy chairman of the company.

Mr. Robert Teasdale, telephone manager of the Scotland West Area, has been appointed telephone manager of the Glasgow Area in succession to **Mr. A. E. Coombs** who has retired after sixteen years in Glasgow. Mr. Coombs was formerly at Liverpool.

At the annual meeting of the Electrical Contractors' Association of Scotland (Glasgow and West of Scotland) **Mr. James D. D. Shaw,** manager and director of James Kilpatrick & Son, Ltd., Paisley, was elected chairman for the ensuing year.

Mr. W. L. Newnham, M.N.Z.I.E., formerly assistant engineer-in-chief of the New Zealand Public Works Department, has been appointed to succeed Mr. J. Wood as engineer-in-chief and under-secretary of the Department. According to the *New Zealand Electrical Journal,* he joined the public service in 1906 and after holding various positions, was appointed assistant engineer-in-chief and deputy head of the Department in 1940. **Mr. T. M. Ball,** A.M.Inst.C.E., M.N.Z.I.E., formerly second assistant engineer-in-chief, becomes assistant engineer-in-chief.

Obituary

Lieut. J. M. Iago.—The death occurred on active service on May 24th, of Lieut. (Electrical) John Martindale Iago, A.C.G.I., B.Sc.(Eng.)., R.N.V.R., who was serving in H.M.S. *Hood* when she was lost. Lieut. Iago was twenty-five years of age.

Mr. M. Mohr.—We regret to report the death, on May 27th, of Mr. M. Mohr, one of the original directors of the Micanite & Insulators Co., Ltd., in his 85th year. Micanite was first manufactured in America in 1893, and in the year 1894 Mr. Arthur Berkeley and his brother, the late Mr. Edward Berkeley, undertook the introduction and distribution of micanite products in Europe. They were joined in this venture by Mr. Mohr and soon after it was decided to manufacture micanite in England, and a manufacturing company was formed in 1901. As the business grew, and other materials were developed, various premises were in turn utilised and in 1906 the company changed its name to its present title. In 1908 it became a private company, and it was decided to build a larger factory at Walthamstow on the site of the present main Works. Numerous additions have been effected from time to time and other premises acquired.

Mr. Mohr was a man of vigorous and genial personality who never spared himself and was a continual incentive to effort to those around him. Amid his business activities he always found time to take a personal interest in the employees. He was able to participate in the affairs of the company up to the end.

Mr. J. R. M. Elliott, of Newcastle-on-Tyne, who was superintendent engineer to the Northern District of the Post Office for eighteen years until his retirement in 1930, has died aged seventy-one. Mr. Elliott joined the Post Office in 1883 and eight years afterwards transferred to the engineering section. He designed the system of telephone bells in the House of Commons for calling M.P.'s when a division is to be taken. He supervised the change-over to the automatic telephone system at Newcastle-on-Tyne.

Mrs. H. Brook.—Many readers will wish to join us in expressing sympathy with Mr. Ernest Brook, founder of Brook Motors, Ltd., whose wife, Mrs. Harriet Brook, died suddenly on May 18th and was buried at Edgerton Cemetery, Huddersfield on May 21st. Mr. and Mrs. Brook were married in August, 1896.

Mr. A. R. H. Jackson.—We regret to hear from Erskine, Heap & Co., Ltd., that Mr. A. R. H. Jackson, their chief engineer and a director of the company, died on May 27th in his 65th year. Mr. Jackson was educated in Liverpool and went to the General Electric Co. as a premium apprentice in 1898. On the foundation of Erskine, Heap & Co., in 1905, he joined the concern as chief draughtsman, rising later to be chief engineer; in 1939 he was elected to the board. He was working right up to the day of his death.

Mr. Frank Emmett, whose death occurred on May 21st at the age of forty-seven, was in business at Southgate, Wakefield. After serving his apprenticeship with the Simplex Co., at Sheffield, he became associated with the business of his father, the late Mr. Walter Emmett, electrical engineer, and took over control of the business on his father's death.

Mr. William Cradock Knight, whose death occurred on May 21st, was manager of the Colliery Department at Sheffield, of Callender's Cable & Construction Co., Ltd. He was sixty-nine years of age and had been with Callender's for forty-three years.

Mr. H. Higham.—The death occurred recently, after a short illness, of Mr. H. Higham of British Insulated Cables, Ltd., at the age of fifty-eight. Mr. Higham had been a member of the staff for thirty-five years and had been for some time manager of the condenser department.

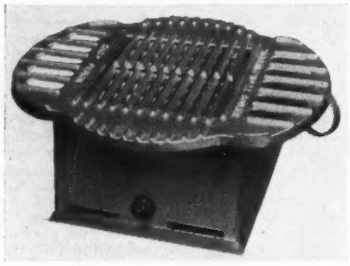
Mr. J. P. Smith, who has died at Barrow-in-Furness at the age of seventy-seven, was chairman of the town's Electricity Committee for a period of twenty-one years.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Handy Boiling Plate

THE latest boiling plate to be marketed by BELLING & CO., LTD., Bridge Works, Southbury Road, Enfield, Middlesex, has a hob made of fine-grained cast-iron and a sheet

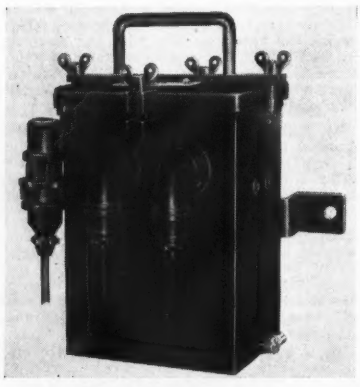


Strong boiling plate that can be used as a fire

steel body, the whole having a silver-like finish that is heat resisting. It measures 12 by 10 in. and the unusually shaped top is large enough to allow three or four saucepans to be kept boiling at the same time. The design is such as to permit its alternative use as a fire and a handle is provided for moving it about. When utilised in this way it is very safe, avoiding any risk of scorching the carpet or scratching the floor. The heating element, which is of 1,200 W loading, is so well protected that it cannot be flooded and the heavy-gauge spirals are mounted on strong porcelains to withstand hard usage. There is a good cord grip and the earthing connection is welded in accordance with the I.E.E. recommendations. The heating element can easily be rewound by any electrician, a porcelain terminal block being fitted and separate terminals are provided for the resistance wire and for the flexible connector.

Low-Voltage Safety Transformer

For local lighting over machinery and similar situations where normal voltage is inadvisable, including the operation of portable tools, a step-down "Safetyvolt" transformer is offered by the HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD., Hersham, Walton-on-Thames, Surrey. It is of the two-winding design with an earthed metal shield between the primary and secondary; an external earthing lug is also provided. The enclosing case is made of strong sheet metal and for portability there is a removable handle, which is fixed in position by two of the four swivel wing nuts that clamp the cover. Holes drilled in these nuts permit a locking wire to be threaded through them, so that the lid may be sealed against unauthorised access. Alternatively the transformer may be fastened to a wall by means of a fixing bracket attached to the back of the case.



Outdoor 160-kVA "Safetyvolt" step-down transformer

The input and outlet sockets accommodate plugs of different patterns, so that they cannot be wrongly inserted, and are connected to tough rubber covered cable. Chain-anchored screw-on caps can be supplied for sealing the sockets when not in use. The transformer illustrated has a 400-V primary input socket and two 24-V secondary outlets, being compound filled to make it fully weather proof for outdoor installation.

Short-wave Screening Cubicle

High-frequency therapy apparatus radiates energy for considerable distances so that short-wave radio reception and television are likely to be interfered with. As complete screening in the electrical sense seems to be the only real remedy Philips "Metalix" (PHILIPS LAMPS, LTD.), Century House, Shaftesbury Avenue, London, W.C.2, have designed a cubicle for the purpose which complies with the Post Office instructions and other relevant recommendations.

The most generally serviceable size is a 6-ft. cube though special requirements can be met. The lower half is made of sheet metal and the upper sections of 0.25-in. wire gauze

Metal screening cubicle for high-frequency medical apparatus

to admit light and sprayed with metal paint to ensure good electrical continuity. The roof consists of wire gauze and the floor is covered with linoleum. The cubicle is completely sectional, so that it can be enlarged by adding more sections and easily dismantled for erection elsewhere.

If it is to stand in a corner of a room the two sides against the walls can be made entirely of sheet metal, such modifications being carried out without extra cost. Similarly the wire gauze door can be placed in whatever position is most convenient to the user. Two locking handles are provided for good contact and these cubicles are normally supplied complete with the necessary interference suppression filter and metal-sheathed lead for connection to existing wall plugs.

Deaf-aid Microphone

Improvement in respect of size, weight, shape and performance are claimed for an aid to hearing microphone announced by AMPLIVOX, LTD., 2, Bentinck Street, London, W.1., which is designed to be worn on the coat lapel, or to fit snugly under a man's shirt or lady's dress. It is known as the type M.1, and is of the piezo-crystal variety.

The flat case is of moulded black bakelite 2.5 in. in diameter and only 0.5 in. thick at the centre, tapering to a thin edge. It weighs

Moulded bakelite deaf-aid microphone

just one ounce, complete with connecting cord and plug, which is detachable for quick renewal when necessary.

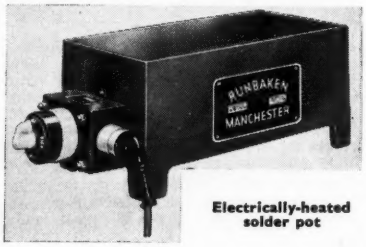
Rectifier Tanks

The use of an aluminium alloy containing 1.25 per cent. of manganese instead of glass or steel tanks for mercury vapour rectifiers has been patented by the ENGLISH ELECTRIC CO., LTD., of Stafford (and others) as a means of ensuring greater resistance to attack of the metal by the vapour. The inner surface is anodised to render the insides of the tanks substantially non-conducting electrically. Following that surface treatment potassium dichromate is forced into the pores on the inner side to ensure that at elevated temperatures the pores do not open sufficiently to admit vapour which might attack the metal. Such tanks are lighter than similar ones made of steel and their thermal conductivity is greater than that of either steel or glass, so enabling heat to be radiated more easily and for that reason permitting a greater output to be obtained from the rectifiers. The walls of tanks made of such an alloy are also said to be less liable to release appreciable quantities of occluded gases, or to permit the passage of air through from outside.

Solder Pots

Solder pots designed for use in aircraft and engineering works are additional "Runbaken" products announced by ELECTRICAL & AUTO PRODUCTS (1931), LTD., Burton's Building, 71, Oxford Road, Manchester, 1. They are electrically heated and two sizes are made.

One model is 9.5 in. long, 6 in. wide and 5 in. high, loaded to 1,250 W, while the other is 17.5 in. long, 9 in. wide and 8 in. high, loaded to 2,500 W, or to customers' requirements.



Electrically-heated solder pot

Turbo-Alternator Speed Control

Improving Stability on an Interconnected System

By A. Abbott

Protective gear engineer, General Electric Co., Ltd.

The author shows how by anticipating the functioning of the governor, the inherent rise in speed due to sudden loss of load may be limited

A LARGE turbo-alternator is required to operate under one of the following conditions: As a single unit carrying a purely local load; in parallel with the grid but also carrying a local load; or in synchronism with other machines in the same power station, which may or may not be paralleled with the grid.

Rapid increase or decrease in load on the system tends to cause the machine or machines concerned to suffer a momentary fall or rise in speed, during which the energy of the steam which is then passing through the turbine and generator rotors causes them to decelerate or accelerate. This is made use of in the speed governor to shift the steam admission valves into a different position. Before the governor can automatically adjust the valves to supply the requisite steam to meet the new machine load, a change in rotor speed must first take place; in other words, the governor only facilitates this regulation after the fall or rise in speed has actually happened.

If the machine is operating as a single unit from which the auxiliary power is derived and suddenly loses a large proportion of external load causing the overspeed device to function, the turbo auxiliaries will shut down as well as the machine itself, resulting in considerable delay in getting the system on load again.

Should the machine be tied to the grid it can lose all or part of its load only if the whole system loses the same percentage of load or if the grid tie-switch trips out. In the former event the whole system will speed up in synchronism and the tripping out of the individual machines on overspeed will depend on the setting of the emergency governor on each turbine. If the set is disconnected from the grid by the opening of the tie-switch the conditions are then the same as those of the single unit operated independently.

In British Standard Specification No. 132–1930 for steam turbines, Clause 3 ("Governor Characteristics") reads as follows: "When operating at rated speed and the rated load is thrown off, the steam pressure, steam temperature and exhaust pressure remaining normal, the maximum variation in speed shall not be sufficient to bring the emergency governor into operation and the permanent variation shall not exceed 4 per cent. of the rated speed."

The tripping speed of the emergency governor is generally 10 per cent. above normal speed. In modern medium- and large- capacity turbo-generators, working with steam conditions above those common in the past, the balance of energy input to the turbine and load absorbed by the acceleration of the rotors immediately after the loss of load becomes unfavourable on account of the large steam capacity of the turbines and the small inertia of the rotors as compared with older types.

The speed governor, which depends on speed increments to shut the steam valves (the closing time of which is delayed by the inertia of the governor itself and of the mechanical transmission gear and oil flowing in the pipes) may not be capable of arresting the momentary speed rise within the limit of the tripping speed. In practice, it takes the speed governor approximately 3 sec. to close the steam valves. If this delay can be substantially reduced, the rise in speed will be reduced also and the overspeed governor is unlikely to operate.

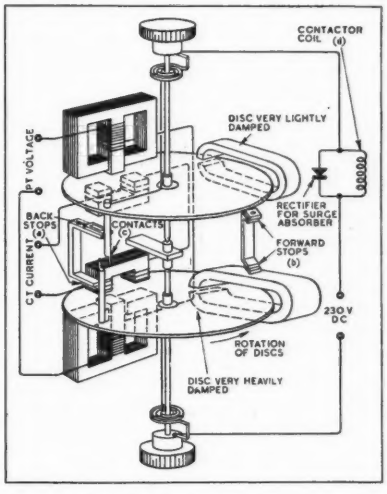


Fig. 1.—Double-acting wattmeter type turbine relay

Governor Anticipation

Even with instantaneous closing of the valves, however, there would still be a momentary speed rise in excess of the permanent speed rise due to the steam already inside the turbine at the moment the valves began to close, but this speed rise would be appreciably below the setting of the emergency governor. The problem presented, therefore, is to allow the turbine governor to perform its normal duty but to devise some means of checking the excessive speed rise during the period taken to close the steam valves; in other words, the governor must be anticipated.

An investigation of the problem was carried out some two or three years ago by engineers in this country which resulted in a scheme of "lost-load" protection or "governor anticipation." Essentially the scheme, which has been applied to a few large turbo-alternators, consists of a DC solenoid which rapidly shifts the governor sleeve to the no-load position (steam valves practically closed) after the loss of load, and allows the sleeve to remain in this position for about 2 or 3 sec. After this period the solenoid is de-energised and the sleeve immediately released, the governor then taking control in accordance with the new value of machine load.

The solenoid is actuated by means of a high-speed relay which operates by virtue of the lost load; thus the turbine governor is anticipated, the solenoid-controlled sleeve practically cutting off the turbine steam for a brief period. This checks the excessive rise in speed, because such anticipation reduces the time delay between the instant of actual loss of machine load and the reduction of the motive power of the turbine caused by the delayed action of the steam valves. This time delay cannot be eliminated entirely, but any reduction afforded will be a substantial gain in preventing the inherent rise in speed from approaching the point of overspeed trip.

There are two methods of actuating a relay to give the desired effect when the machine load falls. The first is to make use of the sudden drop in load amps. and the second to utilise the drop in watts. The former principle has the disadvantage that if the machine is paralleled with others, sufficient wattless current may circulate between machines to render uncertain the action of a pure current relay; in other words, a drop in load current might cause a rise in idle current and the whole object of the scheme would be nullified.

The turbine relay is, therefore, of a double-acting wattmeter type, the upper and lower elements of which are in effect two single-phase wattmeter movements, each with its induction disc pivoted separately to allow independent movement through an angle of about 120 deg. Attached to each disc spindle is a spiral spring controlled by a torsion head, the settings of which are such that when the relay is de-energised the disc of each element is held back against the stops (*a*) in fig. 1, the upper one of which is set slightly in advance of the lower, so that the contacts (*c*), one pole of which is affixed to each disc, are about ¼ in. apart. When the relay becomes energised by virtue of the machine load, the torque exerted on each disc opposes the back torque of the springs until, at a value of 80 per cent. of rated load, both discs are held against the forward stops (*b*), the lower stop this time being set in advance of the upper stop in order to keep the contacts (*c*) still open.

Method of Connection

The two wattmeter elements are essentially in series and their current and potential coils connected to the machine current and potential transformers as a single-element three-phase balanced-load watt-hour-meter. The driving torques of both elements are, therefore, proportional to the kW loading of the machine, since large machines seldom operate at a power factor of less than 0.8 and the effect of $\cos\phi$ does not appreciably lower the relay torques. It is necessary for the damping of the lower disc to be greatly in excess of that of the upper disc.

When the machine is off load, the wattmeter relay discs are in the restrained position and the DC contacts (*c*) are open. When the machine has been run up and synchronised, the gradually applied load increases the driving torques on both induction discs until, at approximately 45 per cent. rated load, the upper disc commences to move forward off the stop, this rotational movement winding up still further the spiral spring. The disc of the lower element performs a similar action when a value of about 50 per cent. load is reached.

This advancement of the upper movement over the lower ensures that the relay contacts do not make during the time both discs are traversing the 120 deg. angle of rotation towards the forward stops (*b*), which corresponds to the time taken to increase the

machine load from 50 to 80 per cent. of rated value. The relay conditions for all values of load in excess of 80 per cent. are with both discs held against the forward stop (*b*) and the control springs wound up to the allowable limit of tension. The action of the relay is reversed when the machine load is reduced, the lower disc reaching the back stop first and the gradual reduction in load keeps the contacts (*c*) apart.

If the machine is carrying full load and half is suddenly lost, the immediate consequence is a corresponding reduction in the driving torques of the wattmeter relay, both discs rapidly returning to the no-load settings. The upper disc, however, being only lightly damped returns more quickly than the lower disc, with the result that the DC contacts are caused to close in about 0.05 sec. after the loss of load.

Referring to fig. 2 the closing of contacts (*c*) of the wattmeter relay energises simultaneously the contactor coil (*d*), making alive the governor solenoid, and the coil of the time delay relay (*e*). Fig. 3 illustrates how the energised solenoid lifts the pilot sleeve so that the oil space of the power cylinder becomes immediately connected to drain and the steam admission valves are thus allowed to close immediately.

The whole sequence of operations from the closing of the wattmeter relay contacts (*c*) to the shifting of the governor sleeve to the no-load setting, takes place in approximately 0.2 sec. At the instant of closure of the solenoid contactor, auxiliary contact (*f*) in fig. 2 is made. This maintains the DC supply on coils (*d*) and (*e*), at the same time short-circuiting contacts (*c*), which open when the discs return to rest on the back stops. Contact (*g*) is adjusted to open after the turbine governor has taken control of the steam influx in accordance with the new value of machine load, normally in about 3 sec., but depending on the governor characteristics.

Considerable Overlap Reduction

The equipment has thus anticipated the turbine governor, and the period between actual loss of machine load and reduction of motive power has been reduced from approximately 2 to 0.2 sec. The rise in speed is also reduced in the same proportion of 10 to 1 and is thus prevented from encroaching upon the overspeed trip setting. As the maximum period of operation of the equipment as determined by the time delay element (*e*) would never exceed, say 3 sec., the solenoid-controlled sleeve can be made to anticipate the governor even more quickly (as experiments have proved) first, by highly over-rating the electrical components and, secondly, by reducing to a minimum the inertia of all moving parts.

All attempts to improve the anticipation of the governor will increase the efficiency of the equipment, though a point must eventually be reached at which the time delay cannot be cut down any further, when the speed rise will be well below the emergency overspeed trip setting. Should the machine load be at any value between 50 and 80 per cent. of normal rating the contacts of the wattmeter relay would be midway between the back stops (*a*) and the forward stops (*b*) fig. 1. Whatever be the position of the contacts they will always be kept apart by the advanced setting of the upper torsion head, and as the increase or decrease in load when the machine is being run up or shut down is only gradual, the contacts will not be permitted to come together to make the circuit.

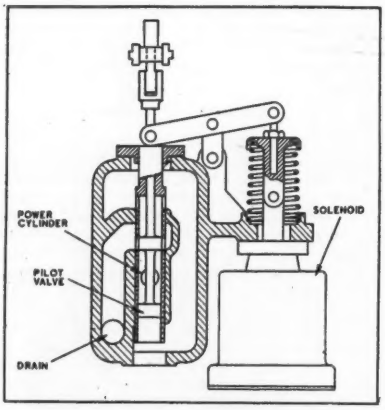


Fig. 3.—Operation of pilot sleeve by energised solenoid

Inadvertent operation would probably be confined to the wattmeter relay, *e.g.*, through the blowing of a potential transformer fuse or open circuiting of the current-transformer secondary. Assuming the machine load to remain stable, mal-operation of the lost-load protection would result in the solenoid-controlled sleeve functioning and reducing the steam consumption to the no-load value for about 3 sec., after which period the solenoid would release the sleeve and the turbine governor would resume control again in accordance with the stable value of machine load.

The equipment would only mal-operate once, because the wattmeter relay discs immediately return to the de-energised position.

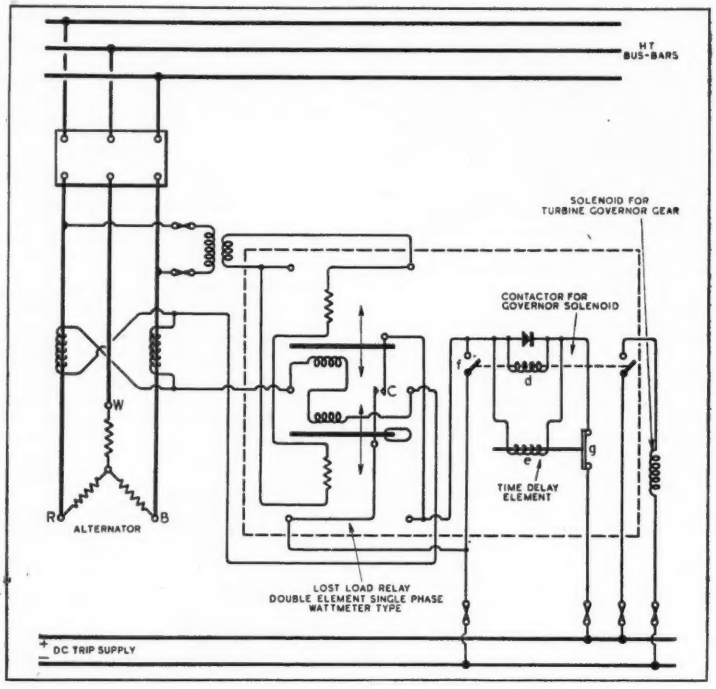


Fig. 2.—Relay circuit diagram

The worst that can be expected is that a power swing might be reproduced on the network, but it would rapidly die down due to the inherent damping agencies on the system; no loss of load or synchronism should result, as the actual time of steam cut-off is much too short.

Measuring Skin Effect

In a report of the British Electrical and Allied Industries Research Association (Ref. N/T69) dealing with "The High Frequency Properties of Various Forms of Wire Specimens," which has been prepared by Mr. G. G. Sutton, a method is described by which the skin factor of conducting wires may be measured at frequencies of 400 Mc. The method, which depends upon the thermal effects of electric currents may be applied to the measurement of high-frequency currents. Reasonable agreement with calculation is found for simple non-magnetic wires.

Ferro-magnetic wires are shown to have very high skin factors, but the effective permeability determined therefrom decreases with frequency, tending to a small value. The effect of longitudinal unidirectional magnetic fields upon the AC resistance of mumetal, already found at telephonic frequencies, has been discovered to persist to very high frequencies.

Copies may be obtained from the Association, 15, Savoy Street, London, W.C.2, at 6s. 4d. post free.

Low Copper-Loss Transformer

A new type of transformer designed to allow a considerable change in the ratio of transformer losses without increasing the exciting current unduly is described in the *Electrical World*. The core is made by winding steel strip, welded end to end, in continuous coil form into a cruciform section, on a single-winding lathe. It is then clamped to reduce winding bulge and annealed to relieve inherent winding strains on corners, retaining its previous magnetic characteristics. The round solenoid-type conductor coils with low resistance and reactance are said to give better regulation at all power factors, a high short-circuit capacity, and a reduction in variation of impulse strength.

Electrical Engineering Exports

Effect on Technical Development

By L. A. Williams, B.Eng., A.M.I.E.E.

WHILST the business of export trade is commonly regarded as the prerogative of the commercial community, it is a fact that the modern electrical engineer is becoming more and more concerned with matters in which the commercial or economic interest predominates over purely technical considerations. Moreover, electrical engineering exports are a vital part of the country's economic resources, and of profound importance to the manufacturing side of electrical engineering.

Mr. Williams is assistant export manager with Ferranti, Ltd., but emphasises that the opinions expressed in this article are not necessarily those of his company

No apology, therefore, is made for suggesting that the industry as a whole, and engineers in nearly all branches of it, cannot afford to disregard the important effect of these exports on the development of the industry, both technically and economically. To cite one obvious general case, the research done by firms and organisations on "tropical finish" has led to developments affecting the design of apparatus not primarily intended for tropical use. Developments equally or more far-reaching can be expected provided that those engaged in the electrical industry, although they have no direct or indirect interest in export, are made "export-conscious."

It is fully recognised, of course, that manufacturers, whose export business forms a high proportion of their turnover, are keenly alive to the need for planning to meet future demands, but it is felt that their attitude of awareness to the situation should be shared by other firms and by bodies and individuals connected with the industry if full advantage is to be taken of this country's capacity to export electrical engineering goods.

The outlook of manufacturers may be summarised under one of the following three heads :—

1. Exports are unimportant incidentals to the main business of home trade.
2. Exports are a natural and important corollary to home trade.
3. Exports are the mainstay of the manufacturer's business.

Under classification 1, the manufacturer's policy is to refrain from any important expenditure on export market development, and whilst considering the export inquiries and orders which come his way, to quote or accept business only if the goods required closely approximate to standard home practice. In the electrical industry, classification 3 is unusual ; the main effects of electrical engineering exports, therefore, result from the activities of manufacturers coming under classification 2.

Spreading Overhead Charges

It is the purpose of this article to stimulate interest by a frank discussion of the present position, of pre-war trends and their modification by the war, and of the probable future of the industry's export business. The subject can be conveniently approached, therefore, by briefly studying the fundamental basis on which most export business rests. This is simply that many manufacturers have found that by increasing their volume of products above home demands and selling the surplus at a price lower than that at which they have to sell at home to make a fair profit, they make a bigger total profit without, at the same time, having to increase their plant.

To take a simple case: Suppose a factory has a normal output for the home market of, say, 10,000 units, with no export. Let the cost, including those overheads which are roughly proportional to manufacturing costs, be £100 per unit, the selling price £150 per unit and the constant overheads £200,000. The annual accounts would read:—

Production cost of 10,000 units ..	£1,000,000	Sale of 10,000 units at £150	£1,500,000
Constant overheads	200,000		
Total production cost	1,200,000		
Profit	300,000		
	£1,500,000		£1,500,000

Suppose the home market to be such that no more units could be absorbed at £150 and that even substantial reductions in price would not greatly increase the number of units sold but, on the other hand, 1,000 units could be absorbed in export markets at an average ex-works price of £110 per unit and that this additional 1,000 units could be produced without expansion of plant thus leaving the constant overheads substantially unchanged. The annual accounts would then read as follows :—

Production cost of 11,000 units ..	£1,100,000	Home sales 10,000 units at £150	£1,500,000
Constant overheads	200,000	Export sales 1,000 units at £110	110,000
Total production cost	1,300,000		
Profit	310,000		
	£1,610,000		£1,610,000

That is for 10 per cent. increased production in order to meet export requirements at 75 per cent. of the home price, total profits are increased 3⅓ per cent. Generally speaking, if export prices are not too low in relation to home prices a large volume of export business can be absorbed to the manufacturer's profit provided that no important additions to plant are necessitated. Equally, a very large export business can be taken without loss purely for purposes of prestige or, in wartime, for the purpose of securing foreign currency.

Great Britain has supplied much production equipment to overseas customers in recent years. The effect of this upon our export trade is studied and certain conclusions are reached which will be dealt with in more detail in a further article

With seasonal trade, as in the case of many domestic electrical appliances, exports for countries in the Southern Hemisphere, such as South Africa, Argentina, Australia and New Zealand, are mostly required during the off season in the home market, and the export demand may often be stimulated to a level which necessitates production when it is most required for the purpose of keeping operatives in continuous employment. In such seasonal trades, of course, the demands of territories in the Northern Hemisphere require to be considered in conjunction with home market demands owing to their approximate coincidence with these.

Of particular interest to design engineers there is the effect of special export requirements on manufacturing processes and plant. "Tropical finish" has been cited as an important instance and the relevant features of this are the measures taken to render electrical plant proof against the effects of damp, corrosion and vermin. Among other important aspects there is the not infrequent production of a "low cost" export design, the novel features of which, after proper experience under service conditions, may well be incorporated in standard home designs leading to a general reduction in manufacturing costs and prices. Instances could also be cited of a potential export demand being the factor influencing a decision to develop special equipment for which the home demand alone is too small in units and monetary value to justify development work.

Meeting Local Requirements

Many instances arise in which a decision must be made at the outset as to the standards to which goods will be made, *i.e.*, whether the manufacturer shall work to B.S.S. in preference to foreign standard specifications or vice versa. Future business with the market concerned may be altogether bound up with the decision made, particularly where considerable tooling is necessary, as with electrical accessories involving a lot of repetition work. Insistence on home standards is quite likely to drive the customer into the arms of foreign competitors or, at best, lead the customer ultimately to seek a manufacturer who will supply him with goods according to *his* idea of what is best for the market instead of with an alternative which the manufacturer may regard as equivalent but which, owing to local market peculiarities, is merely a makeshift.

Compliance with local requirements, therefore, may, and frequently does, result in the manufacturer concerned obtaining a

firm foothold in the market or even a virtual monopoly. In such cases, whilst the manufacturer is justified in expecting a fair return in his price for the trouble and expense involved in developing specifically for the market, it is positively dangerous to his future prospects for him to trade on his monopolistic position by bleeding the customer to the extent of insisting on the "home market" price level or even better. Such an attitude will almost inevitably lead to a local manufacturer setting up in opposition and, with the local patriotism which can be aroused in support of his products, probably sweeping everything before him, quite apart from any official encouragement he may obtain in the way of duties, quotas or subsidies.

A wider issue must be faced when considering the effects on future export business of our having placed many countries on the map from the electrical engineering standpoint through exports already made. Australia and New Zealand, for example, have extensive and up-to-date networks, with standardisation of equipment, voltages and ratings, installation practice and approval specifications which, in many ways, go beyond our own. Australian industry has advanced to a point at which, before the war, it was tending to become competitive with our own in export markets, for all but the most specialised plant and apparatus. New Zealand is equipped with an adequate range of secondary electrical industries under the apparently permanent protection of a customs tariff and quota system. South Africa, largely on account of the gold mining industry's electrical requirements, is at least as well equipped with generation, transmission and distribution plant as Australia, and the development of local electrical manufacture on a similar scale cannot be long delayed when the war ends and may take place before then.

What the United Kingdom has done for these Dominions, other countries, chiefly the United States, have done or are doing for Argentina and Brazil. It must not be forgotten, moreover, that largely owing to the fundamental basis of electrical engineering exports the countries so equipped have obtained their equipment at a comparatively low cost. In some respects at least, therefore, the supplying countries have placed their customers in a position to outbid them in the general export market.

This seeming anomaly is qualified when account is taken of the research and development organisations built up at considerable cost and effort by the home manufacturers. Clearly, unless the home manufacturers can count on a future demand for products which can only be made available with the support of these organisations, they are digging a grave for their businesses as surely as the cotton industry did when it equipped competitor countries, such as Japan.

It is that demand of the future which must occupy the attention of all electrical engineers however remote from export their work may seem to be, if full benefit is to be derived from the formidable resources of plant, personnel, apparatus and data which have been built up. Only by creating the demand and ensuring that it is met by the old-established manufacturer at home instead of by the newly-established manufacturer overseas can the industry in this country hold its business and the personnel retain their positions in the industry. With these conditions satisfied, the newly-established manufacturer overseas can be a serious competitor outside his own protected home market only if he is prepared, often at ruinous cost and with the assistance of his Government, to incorporate research and development apparatus and staff duplicating that of the home manufacturer.

In addition, the home industry must, for its own salvation, consider seriously what steps it can take to prevent the drift to newly-established manufacturers overseas of the cream of its research, development, production and executive personnel upon whose knowledge, experience and continued guidance the future of the home industry is so largely dependent.

The nature and extent of the export demand which will arise or which can be created is entirely a matter for speculation and debate, but this must be indulged in by electrical engineers if the most useful planning for the future is to be achieved.

Potatoes for Pig Food

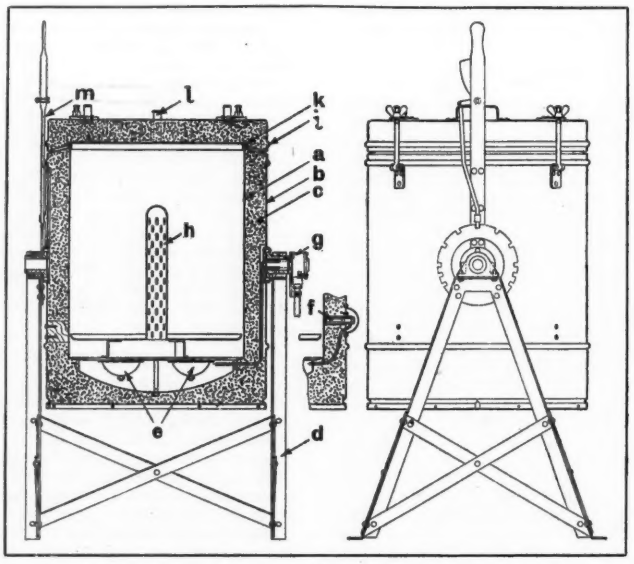
Electrical Steaming Apparatus Used in Germany

By Theodore Rich

THE pending reduction in the supply of foodstuffs for farm stock, owing to shipping difficulties, makes one wonder whether adequate use is being made of home-produced supplies. For years past in Germany cooked potatoes have been utilised for stock feeding, especially for pigs in order to reduce the dependence on imported foodstuffs. As long ago as 1926 the power company serving the major part of the Province of Brandenburg took up the question of the steaming of stock foods by electricity on the farm, especially that of steaming potatoes for pigs, in order to be useful to agricultural consumers and to develop a valuable steady night load for its electricity supply, which could be sold at a low price.

For this purpose a special cooker was developed and supplied to farmers. It had been found previously that steaming potatoes gave better results than boiling, and although many steamers were originally operated with coal or wood, the general convenience and automatic control features practicable with electrical heating allowed for a slow operation which gave a superior food value, a dry floury product, and one that was much liked by the stock.

The steamer consists of a galvanised cylindrical vessel, with an insulating jacket and lid. It is mounted on bearings like a churn, and is fitted with a tipping locking lever. Usually three sizes are made, for about 80, 155 and 308 lb. of potatoes respectively, the largest size being for twenty-four pigs. The method of construction can be seen from the illustration. The farmer puts the potatoes and necessary water in at night and thanks to automatic control, the potatoes are correctly cooked by the early morning. The food keeps warm throughout the day without the apparatus being switched on and the operational cost is low owing to the special low night rates. There is no danger of burning the food and the apparatus is protected against running dry.



Constructional details of a potato steamer

(a) is the steaming cylinder, (b) the galvanised outer jacket, (c) the heat insulation, (d) the stand, (e) the heating elements, (f) the thermostat heat regulator, (g) the connector box to take the incoming cable, (h) the steam inlet tube, (i) the insulated cover fastened with hinged bolts and wing nuts, (k) is the gasket for making the cover tight, (l) the vent, and (m) the adjustable handle for tipping the cylinder to various angles

According to information received some years back the system was greatly appreciated by farmers and smallholders. The power company concerned, ten years ago prepared a list of nearly 150 farmers and smallholders who had written expressing their satisfaction with the type of apparatus for the duty required. This fact tends to show the extent to which steamed potatoes are used for pig feeding purposes in Germany.

The apparatus can be used also, out of cooking hours, as a wash boiler. The design and construction is such as to bring the cooker within range of the farmer's purse. The treatment of potatoes on the farm itself obviously has certain advantages over factory processing, with its transport difficulties. It would be a pity if many pigs have to be slaughtered too soon when they can be well fed and fattened on hot steamed potatoes.

COMMERCIAL and INDUSTRIAL NEWS

Utility Insurance Scheme. Surplus Appliance Register.

Utilities and War Damage

IN the House of Commons last week, the Chancellor of the Exchequer stated that the general lines of a scheme for the insurance of public utility undertakings against war damage had been framed but the complicated nature of the subject necessitated further consultation on a variety of technical matters. Representatives of the principal public utility groups would be asked to meet his advisers and legislation would be introduced as soon as possible after these consultations.

The scheme referred to by the Chancellor covers both fixed and moveable property and will be administered by the War Damage Commission. The members of each group of undertakings will be called upon to pay half of the estimated aggregate war damage payments to the group in four annual instalments, the first of which will fall due on July 1st, 1942. Periodical adjustments in the amounts will be made in the light of future estimates of war damage payments. The division of the "premium" will be left to each group but failing agreement the Treasury will have power to prescribe a scheme by Order. After the war the War Damage Commission will report upon actual payments made with a view to the reduction of the payments by the undertakings if possible.

In the case of repairs the war damage grant will be equal to the actual outlay, apart from any increased expenditure on account of improvements introduced. Where it is necessary to replace structures or moveable assets the net outlay will be refunded, due regard being paid to the degree of obsolescence of the destroyed assets. Alternatively a "value payment" will be made where an irreparable asset is not replaced.

The scheme, which it should be noted has yet to be finally settled and approved,will apply to the first "risk period" (which ends on August 31st next). It is possible that it will not be applied to every type of public utility undertaking; one or two of the smaller groups may be brought within the scope of the ordinary operation of the War Damage Act.

Commercial Travellers' Benevolent Institution

The half-yearly Court of Governors of this Institution is to be held at the London offices, 4b, Frederick's Place, Old Jewry, London, E.C. 2, at noon on June 28th.

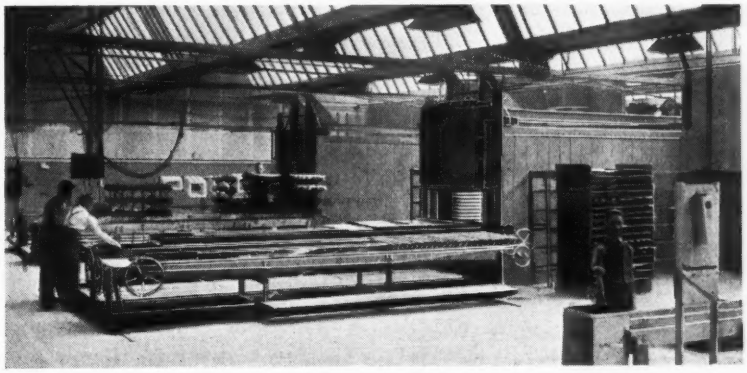
Limitation of Supplies

The Board of Trade has made an Order, the Limitation of Supplies (Miscellaneous) (No. 11) Order (S. R. & O. 1941 No. 700), regulating supplies of controlled goods during the quota period, June 1st to November 30th, 1941. The changes in the quota percentages have already been announced. These and the few other changes made by the new Order are explained in a memorandum, copies of which will shortly be obtainable from the Stationery Office.

The President of the Board of Trade has urged wholesalers on a number of occasions to pay regard to shifts of population and also to spread the available supplies to the shops evenly over the six months' quota period. With the commencement of a new quota period on June 1st, it is of special importance that in accepting orders for delivery in June, manufacturers and wholesalers should have regard to the distribution of population and should also aim at not supplying in the aggregate during the month more than one-sixth of their total quota.

Vitreous Enamelling Plant

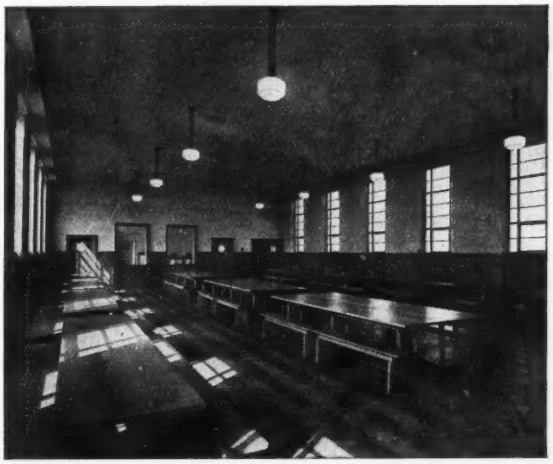
The accompanying illustration shows two 140-kW modern electric box-type vitreous enamelling furnaces now installed in the porcelain enamelling department of the Blackburn factory of Moffats, Ltd. Each unit has a normal working temperature of approximately 1,600 deg. F. and is equipped with automatic pyrometer temperature control, together with electric door control. A continuous electric dryer used in conjunction with these furnaces has a forced heat circulating system, the loading of which is 76 kW. The variable speed control for the conveyor is 3 to 6 ft. per minute. The inside of the dryer is porcelain enamelled for washing down and easy cleaning. Both the furnaces and the dryer have been designed and made by the company's engineers.



Vitreous enamelling furnaces (140 kW) installed in Moffats' factory at Blackburn

Modern School Lighting

Recent examples of careful planning of lighting are provided by the new schools at Lostock, Light Oaks, Alkrington and Broughton in Lancashire. In each classroom, study, assembly hall, etc., the positions of the fittings as well as the wattage of the lamps are such that the resulting illumination is even and so well diffused that excessive glare and deep shadows are greatly minimised.



The dining room of the Broughton Senior Schools, Salford, Manchester

All the schools are similar in character; similar fittings are used throughout; and the schemes were planned by the same architect (Mr. P. Howard), and carried out by the same electrical contractors, H. C. Taylor & Co., of Manchester.

The whole of the electrical fittings for the new Broughton Senior Schools, Broughton, Manchester, together with the necessary switchgear, lighting and power plugs, electric cookers and irons were supplied by the General Electric Co., Ltd. In all, approximately 475 lighting fittings are installed. These include ceiling type units with opal glassware; "Coolicon" opal glass reflectors; watertight units in exposed positions, pendants, etc. In the two large assembly rooms thirty bronze-colour fittings with open type opal glassware are used, and it is significant of the systematic planning throughout that these are fitted with special suspension rods so as to ensure the adequate diffusion of light by correct location of the lamps. The combined installation of the lighting and power systems necessitated the use of 147,250 ft. of cable and 46,302 ft. of conduit together with many conduit and other fittings.

Register of Surplus Stocks

The Electrical Development Association announces that the third issue of its register of surplus stocks of domestic appliances, motors and other equipment held by electricity supply authorities is available to members who apply for it. The list gives particulars of over a thousand appliances offered by 48 undertakings.

In view of the increasing scarcity of apparatus, advances in price and the effect of the Purchase Tax, inquiries for apparatus have recently increased. One London undertaking completely sold out its stock of surplus cookers, having received orders for over 1,300.

Care of Appliances

The difficulty of finding the necessary materials and labour for the repair of domestic appliances makes it essential that consumers should be taught to handle their equipment with extra care. The Torquay Electricity Department has wisely circulated some advice to all its consumers on the subject. It particularly draws attention to the care of flex attached to portable appliances which it says should not be subjected to strain or kinking.

Members of the Electrical Development Association who desire to emulate Torquay's example can obtain from the Association small printed slips to be circulated with accounts.

Insurance of Commodities

The Board of Trade has, with the approval of the Treasury, decided that, in respect of the period beginning June 3rd, 1941, and ending September 2nd, 1941, the rate of premium payable under any policy of insurance issued under the Commodity Insurance Scheme shall continue to be at the rate of 7s. 6d. per cent. per month. It is also announced that the

period of grace allowed under the private chattels scheme is to be extended from May 31st to June 15th.

New Reserved Occupations

The Ministry of Labour and National Service announces the addition to the Schedule of Reserved Occupations of boiler fitters' or mounters' labourers and coppersmiths' labourers who are reserved at thirty-five. At Stage B they will remain reserved at thirty-five if they are employed upon protected work. These entries are not retrospective in their effect; that is, they do not involve the release of men who are now in the Forces or of men who have already received enlistment notices.

Public Service Transport Association

The Council of the Public Service Transport Association does not propose to hold a conference this year, but the annual meeting has been provisionally fixed for July 11th; it will be purely a business meeting.

Changes of Address

The Hull branch of the General Electric Co., Ltd., has been moved to Magnet House, 172, Anlaby Road, Hull (telephone: 36295).

The Spencer Wire Co., Ltd., has transferred its London offices to Chandos House, Buckingham Gate, Victoria Street, S.W.1.

Norman Bros. (Electrical), Ltd., have moved to 80, St. Mary's Road, Ealing, London, W.5 (temporary telephone number : Ealing 4841).

Electricity Authorities' Works

The Ministry of Works and Buildings has instituted a system of block allocations to Departments (in terms of labour and money value) to ensure the best use of available labour and materials for the carrying out of essential building and civil engineering works. The allocation to the electricity supply industry represents an average monthly expenditure for the six months May to October, 1941, and the responsibility of ensuring that the industry does not exceed the total allotted has been placed upon the Electricity Commissioners who have called for the necessary returns from supply authorities.

The works concerned included site works, buildings, plant foundations, cooling towers, excavation and reinstatement of cable trenches, cable laying and the erection of overhead line supports. They do not include the manufacture or erection at site of plant, the drawing-in and jointing of cables or the erection of overhead line conductors, nor do they include any ordinary repair or maintenance works or repairs necessitated by air-raid damage.

Moreover, the scheme does not cover works carried out by labour in the regular employment of the undertaking unless more than twelve workers are recruited from an Employment Exchange for any one job.

New Catalogues and Lists

W. T. Henley's Telegraph Works Co., Ltd., Milton Court, Westcott, Dorking, Surrey.—A booklet describing the characteristics and applications of cold filling compound.

Philips Industrial, Century House, Shaftesbury Avenue, London, W.C.2.—A leaflet describing emergency lighting equipment for workshops, offices, etc.

G. & J. Weir, Ltd., Cathcart, Glasgow.—Publication no 37/1 on the company's "Optimum" de-aerator for eliminating corrosion in power plants.

Dissolutions of Partnership

Following the death on April 22nd of Mr. T. F. Holden, the partnership between Mr. H. G. Hunt, Mrs. N. Holden, sole executrix of Mr. T. F. Holden, and Mr. R. W. Holden carrying on business as Holden & Hunt, electrical and mechanical engineers, Cox's Lane, Old Hill, Staffs. has been dissolved. Mrs. N. Holden and Mr. R. W. Holden will attend to debts and carry on the business. (As we reported in our last issue, a new company has been formed with the title Holden & Hunt, Ltd., of which Mrs. N. Holden and Mr. R. W. Holden are the directors.)

Messrs. M. M. Saunders and N. Goswell, carrying on business as Saunders & Goswell, electrical engineers, 55, Aldersgate Street, London, have dissolved partnership so far as concerns Mr. Saunders, who retires from the firm.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

B.B.L. small voltmeters and ammeters.

Flexible wires with oil-resisting covering.

VARIRATIO or VARORATIO gear unit.

ELECTRONAIRE air purifier and vacuum cleaner (Electronaire Marketing Co., Ltd.).

TRADE MARK APPLICATIONS

AMONG recent applications for British trade marks are the following, objections to which may be entered within a month of May 28th :—

Heptagon, Nonagon and **Decagon.** Nos. 614,034, 614,038 and 614,040 respectively. Class 9. Liquid level indicators, temperature and pressure indicating apparatus and electric measuring and indicating apparatus.—Simmonds Aerocessories, Ltd., Great West Road, Brentford, Middlesex.

Vidaflex. No. 614,662. Class 17. Electric insulating sleeving.—Jones, Stroud & Co., Ltd., Vida Mills, New Street, Long Eaton, Derbyshire.

Wartime Industrial Lighting

AN exhibition has been arranged by the Electric Lamp Manufacturers' Association at 2, Savoy Hill, W.C.2, with the object of demonstrating the application of the recent Factories (Standards of Lighting) Regulations, 1941. This was opened by Sir Duncan Wilson (chairman of the National Industrial Electric Lighting Service) on May 27th, at an informal function presided over by Mr. J. Y. Fletcher (chairman, E.L.M.A. Council).

Among the more notable of the exhibits is one designed to indicate the qualities of the 5-ft. fluorescent lamp, which by its shape and low surface brightness, giving a well-diffused illumination of near-daylight quality, is especially suitable for workshops with low head room. As its heat emission is small, temperature difficulties due to black-out can often be obviated by its use.

Regulations relating to glare and angle of cut-off are illustrated by the disposition of various types of fittings housing different lamps. The discomfort caused by an excess of light near the eye is demonstrated by means of a 500-W standard dispersive reflector, adjustable as to height. The effect of throwing a certain proportion of the illumination on the ceiling is also seen, angle reflectors being mounted on one of the walls. How light sources of different size and brightness may have the same output is shown by luminous panels. Other equipments emphasise the importance of maintaining lamps, fittings and surroundings clean and in good order, of avoiding indirect glare from polished surfaces and of screening local lights.

In the A.R.P. section are to be found street and shelter signs, low-level lighting and correctly masked car lamps. The National Industrial Electric Lighting Service, whose headquarters is in the same building, is ready to give advice on problems of industrial illumination to those interested.

Industrial lighting fittings at the E.L.M.A. Bureau. Left : The lecture theatre. Right: Illuminated drilling machines and demonstration of fluorescent lighting

ELECTRICITY SUPPLY

Dearer Appliances for Hull. Reorganisation Suggested Again

Bingley.—ELECTRIC FENCING.—It is proposed by the Water and Baths Committee to provide electric fencing on seven of the greens at the St. Ives golf course to prevent the straying of sheep. The estimated cost is £16.

Buxton.—STRENGTHENING OF OVERHEAD LINE SYSTEMS.—To minimise the possibility of breakdowns a scheme has been prepared for improving the high-voltage grid transmission arrangements to Buxton. It is proposed before next winter to erect additional steel supporting towers in each span of the Glossop-Buxton line with extra wooden poles in each span of the line from New Mills to Buxton. Most of the Council's suggestions have been agreed to by the Central Board, which, despite a shortage of skilled labour, hopes to have the lines strengthened before next winter.

Chester. — SHELTER INSTALLATIONS. — The The city electrical engineer has submitted a revised estimate of £2,252 for the wiring of surface shelters for 230-V supply.

SCHOOL HEATING.—Additional electric heating is to be provided at Lache school.

WOMEN METER READERS.—The Corporation Electricity Committee has agreed to the employment of women as meter readers.

Croydon.—NEW SUBSTATION.—The Corporation Electricity Committee has obtained sanction to borrow £697 for the erection of a substation.

Hull.—HIRE-PURCHASE CHARGES.—The Corporation Electricity Committee has decided to increase the long-term hire-purchase charges for wash boilers and water heaters. The quarterly charge for wash boilers will be increased from 2s. to 4s., while the charge for immersion heaters will be 5s. per quarter, instead of 3s. The charge for 1½-gallon heaters will be raised from 2s. 6d. to 4s. 6d. The increases will not apply to existing users or to persons who are compulsorily evacuated from premises in which such apparatus is installed. Limitation of supplies and increased purchase costs have made the advances necessary.

Kent.—ELECTRIC POWER BILL REJECTED.—The House of Commons Committee to which the Kent Electric Power Bill was remitted has found the preamble not proved and so the Bill will not proceed. Many local authorities in the county had entered opposition to the measure which was designed to amalgamate three Kent power companies.

Southgate.—BOLLARD LIGHTING. — The Ministry of Transport has approved a scheme for the replacement of oil lamps by electric and gas bollards at a cost of £1,290 with annual running charges of £508. The Corporation Emergency Committee has placed the necessary contracts with the Northmet Power Co. and the District Gas Co. for the conversion work.

Stanley.—REVOCATION OF ORDERS.—Notice is given in the *London Gazette* by the Minister of War Transport that he has revoked the Stanley Electricity Special Order, 1925, and the Tanfield Electricity Special Order, 1925, as from May 23rd. We are informed that this follows the amalgamation of the Stanley, Tanfield and Annfield Plain Urban Districts and the consequent making of a new Order covering the combined area. Supply is taken in bulk from the North-Eastern Electric Supply Co.

Sunderland. — NEW MAINS. — The Town. Council has decided to expend out of revenue £6,512 on extensions to the e.h.v. mains, and the provision of an additional switch-house.

Sutton Coldfield.—SHELTER INSTALLATIONS —The Corporation Emergency Committee has instructed the borough engineer to experiment with the improvement of the lighting and heating of shelter trenches by means of electricity.

Tynemouth.—TARIFFS FOR BLACKED-OUT PREMISES. —At a recent meeting of the Corporation Electricity Committee the borough electrical engineer submitted a letter suggesting that a special concession in the electricity tariffs should be made to those traders who co-operated in protecting their stocks by removing their window glass and providing suitable shutters. He also reported with regard to the tariff which would be in operation to meet the additional cost of artificial lighting when premises were permanently shuttered. He recommended that no change be made in the tariff and the Committee agreed.

Overseas

Australia.—PROGRESS IN BRISBANE.—A clear picture of the continued progress of the Brisbane Electricity Department is given in the official statistics for 1940, a copy of which has been sent us by Mr. J. H. Hindman, manager of the Department. At June 30th last year the undertaking had 61,883 consumers, an increase of 2,900 during the year, and supplied electricity in the Brisbane area with the exception of the city proper, South Brisbane, New Farm and the Kangaroo Point areas. During the year an interconnection was made between the Council's power station at New Farm, and that of the City Electric Lighting Co. at Doboy Creek, with the result that each station can call upon the other in the event of a breakdown. Business continues to expand and a profit of £35,256 was recorded, as compared with £26,566 in the preceding year. Sales of electricity amounted to 117,339,500 kWh, including 29,714,200 kWh for the trams.

Bermuda.—NEW DIESEL PLANT.—According to a Bermuda newspaper, the island's electric power capacity will shortly be increased by 25 per cent. by a new Diesel engine-driven generator, trials of which are now being completed at the power station. The engine, a Fullager type Diesel of 3,275 BHP, made by the English Electric Co., Ltd., is one of the largest stationary Diesel engines ever built in England, a similar unit having been installed in the island in 1937. The engine now undergoing its trials drives an alternator of 2,500 kW and runs at 200 RPM. It was shipped in eight separate consignments and arrived in Bermuda without any loss. The engine itself weighs about 200 tons and is 32 ft. long and 24 ft. high.

India. — PALLIVASAL PROJECT. — Preliminary work in connection with the expansion of the Pallivasal hydro-electric scheme in Travancore to meet the growing demand for power has been in progress for some time. The present development comprises the installation of three generating sets of 7,500-kW each and two penstocks, with the provision of adequate storages in the upper reaches of the Mudapuzha River, where the head works are situated. One more double-circuit 66-kV transmission line from Pallivasal to Awaye is also to be constructed. From developments now anticipated it is expected that within the next ten years the demand on the system will total about 29,000 kW, with an annual production of about 200 million kW. The total expenditure on the Pallivasal project up to the end of the last financial year was Rs. 13,000,000.

New Zealand.—BREAKDOWN AT LAKE COLERIDGE.—The casing of the old No. 5 (1,500 kW) unit at Lake Coleridge power station burst recently and much of the adjacent machinery and switchgear was flooded, with the result that the whole station went out of operation. The *New Zealand Electrical Journal* states that Christchurch was without power for 25 minutes until a limited supply from Waitaki was made available and even then serious dislocation was avoided only by the prompt response of consumers to urgent broadcast appeals to conserve power.

No Reorganisation Yet

IN the House of Commons on May 29th Mr. J. Parker (Labour) suggested that the scheme for the concentration of industry should be extended to electricity supply undertakings.

The Prime Minister replied that it was not proposed to undertake the reorganisation of the electricity supply industry at the present time.

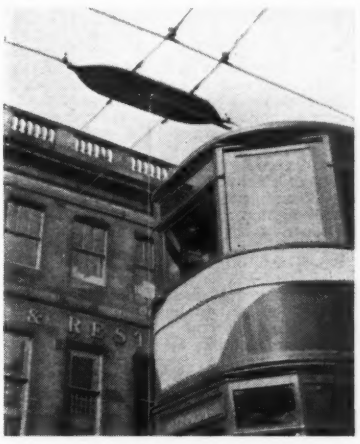
The turbine, which was damaged through the casing breaking away, was one of the first two units installed at Lake Coleridge. Water from the turbine reached the switchboard gear, damaging the instruments, and also wet other generating units, all of which had to be dried out. A large volume of water entered the power house as it was impossible to shut off the head for five minutes after the accident occurred. Fortunately no one was injured by the shattered casing. Quick repairs were effected and just over 24 hours after the accident occurred the first unit was again in service. Other units followed, and within four days the station was, with the exception of the damaged machine, virtually back to normal running.

While Lake Coleridge was out of action the Monowai hydro-electric station and the Invercargill steam plant were brought into full operation.

Sweden.—NEW PLANT FOR MINING TOWN.—*Reuter's Trade Service* reports that the town of Skellefteaa intends to construct a hydro-electric power station on the Selsforsen rapids of the Skellefte river. The cost is estimated at Kr. 9,000,000, and a first allowance of Kr. 1,000,000 has been granted for the immediate starting of construction work. This will be the third power station constructed by the town, which supplies power from these stations to the big mines and smelting works in the vicinity.

TRANSPORT

Edinburgh.—MINIMISING TRAM FLASHES.—Details have been sent us by Mr. Robert McLeod, manager of the City Transport Department, of a new trolley rewiring pan which has been designed by the Department's overhead line engineers to minimise flashing



Tram trolley rewiring pan now used in Edinburgh to minimise flashing

which occurs at terminal points when a conductor is endeavouring to re-establish contact with the live wire. The pan is constructed of a light angle iron framework shaped as shown in the illustration. To this framework is welded a sheet of 18 gauge steel. The angle iron framework is shaped to lead the trolley towards the neck into which projects a tongue or guide suitably ramped on to the trolley wire. The whole pan is supported by double spanwork and is insulated with clevis strain insulators at the pan and porcelains in the normal position. The trolley wire which runs over the top of the pan is secured by means of small saddles at either end. The conductors find that this fitting is always visible against the sky, even on the blackest of nights and it only remains for the conductor, after having turned the trolley, to let it up at a suitable point. Wherever these fittings have been erected, the clearway has been marked with metal blocks to give the driver the exact position at which to stop.

FINANCIAL SECTION

Company News. Liquidations and Bankruptcies. Stock Exchange Activities.

Reports and Dividends

The London Electric Wire Co., & Smiths, Ltd., held its annual meeting on May 29th when Mr. W. J. Terry (chairman and managing director), who presided, said that they had been fortunate in that primary commodities in which they were chiefly interested had been available to meet demands. Some supplies from overseas had naturally risen in price, but not to an unreasonable extent. The initial difficulties in the supplies of electrolytic copper had been overcome and it had been of the greatest assistance to the trade that the price of electrolytic copper had been stabilised at £62 per ton throughout the year. Their home rates had increased. All of their factories had done their utmost to meet the immediate demands of customers and selling prices had been maintained at a low level.

Outstanding contracts and orders carried forward into 1941 were higher than at the beginning of 1940 and there was an absence of speculation in the forward purchases of customers which existed in some previous periods. Export sales had been necessarily reduced owing to increased home consumption and for reasons outside their control.

Post-war conditions would provide many problems which it would seem should be met by careful and collective planning, bearing in mind that in some of our overseas markets secondary industries had, of necessity, been developed, thus tending to make such countries self-supporting. He was of opinion that the post-war phase would not be effectively met by a continuance of any measure of the existing control of industry, which must necessarily hamper initiative.

The Calcutta Electric Supply Corporation, Ltd.—Presiding at the annual meeting held on May 29th, Lord Meston (chairman) said that again they had to record a satisfactory year of continued progress, and sales of electricity showed an increase of 54.2 million kWh as compared with the preceding year. Although domestic consumption had advanced, the proportionate increase was not up to that of previous years. The power load, however, advanced very considerably, and would have been greater but for changes in the working hours of the jute mills. Apart from these mills there was a marked increase in consumption by other industries. The new super-station at Mulajore was in full operation during the year and the advantage to the system of possessing a station with modern plant was borne out by the fact that on the whole system the cost of coal per kWh generated fell by approximately 8 per cent. This, together with the lower price of coal, reduced the fuel bill by £10,000 and that notwithstanding the large increase in the number of kWh generated. Even when the third generating set was in commission they would be hard pressed to meet the demand during the coming winter and they might have to recommission for a period the old Bhatpara station.

The Marconi International Marine Communication Co., Ltd.—Presiding at the annual meeting on May 26th, Admiral H. W. Grant (chairman), in the course of his speech, said that, in spite of the difficulties which lay ahead, he saw no reason whatever for pessimism. New tonnage was coming along and they were hard at work equipping vessels as they were constructed.

The United River Plate Telephone Co. reports gross earnings for 1940 of £4,151,785, as compared with £3,759,379 for 1939. Operating expenses were £1,969,797 (against £1,789,711), depreciation required £910,801 (£881,847), and after providing for debenture bond interest, £362,682 (£322,876), and other charges, there is a net income of £807,339 (against £613,676). An interim dividend of 3 per cent. was paid at the end of 1940. A further interim of 2 per cent. is now announced, making 5 per cent., less tax. The total ordinary distribution for 1939 was 4 per cent.

The Imperial Continental Gas Association, which has a number of electrical interests, reports a net profit for the year ended March 31st of £71,730, as compared with £213,064 for the preceding year, but of this sum £70,000, together with £75,000 transferred from general and specific reserves, has been applied to provide cover for taxation assessments on foreign income relating to previous years, against which an appeal has been lodged. No dividend is proposed (against 6 per cent.), and the balance carried forward is £228,149 (against £226,419 brought in). The report stated that no information is available regarding the results for 1940 of the French and Belgian companies.

Edmundson's Electricity Corporation, Ltd., is again paying a final ordinary dividend of 3¼ per cent., maintaining the distribution for the year at 6 per cent.

The East India Tramways Co., Ltd., is paying an interim dividend of 2 per cent., tax free (against 2½ per cent., tax free).

Siemens & Halske, A.G. (Berlin) report a net profit for 1940 of Rm. 20,420,000 (against Rm. 16,250,000). The dividend is 10 per cent. (same).

The American Telephone & Telegraph Co.—A *Reuter* message states that the company has declared the regular quarterly dividend of $2.25 per share. The company proposes to offer $234 millions (about £58,500,000) convertible debentures to stockholders, primarily for financing new construction.

R. A. Lister & Co., Ltd., are maintaining their interim dividend at 5 per cent.

The National Electric Construction Co., Ltd., is again paying a dividend of 10 per cent. for the past year.

Ferranti, Ltd., has declared the dividend on the 7 per cent. cumulative preference shares for the half-year to June 30th.

New Companies

Mechanical & Electrical Engineering Co. (Sheffield), Ltd.—Private company. Registered May 12th. Capital £1,500. Objects: To carry on the business of proprietors, suppliers, installers, repairers and manufacturers of mechanical, electrical and other machinery, tools, radio apparatus, radio-gramophones, etc. Directors: A. Webb and Mrs. P. L. Webb, both of 159, Bradway Road, Sheffield. Secretary: Miss M. L. Johnson, 1, Guest Road, Sheffield. Registered office: 8, Hereford Street, Sheffield.

Findon Engineering Co., Ltd.—Private company. Registered May 13th. Capital £1,000. Objects: To carry on the business of electrical, wireless, mechanical, heating, motor and general engineers,etc. Directors: M. A. Findon, address not stated; E. Reading, 46, Kingsley Way, N.2; and J. Edelman, 44, Kingsley Way, N.2

Automatic Refrigeration Co. (Leytonstone), Ltd.—Private company. Registered May 14th. Capital £1,000. Objects: To carry on the business of manufacturers of, and dealers in, refrigerators and cold storage machinery, plant and equipment, electrical and general engineers, storage contractors, etc. F. H. Meyers, Belmont Hotel, Highbury New Park, N.5, is permanent director and chairman. Registered office: Coronation Works, Cobden Road, E.11.

Bramor, Ltd.—Private company. Registered May 24th. Capital £1,000. Objects: To carry on the business of manufacturers of, and dealers in, fittings, parts, complete units, supplies, accessories, chemicals, etc., for refrigeration and cold storage, and for the electrical, motor and other industries, etc. Governing directors: C. Brady, 39, Bath Road, Walsall, Staffs (director of Brady Engineering Services, Ltd.) and J. H. Morgan, 26, West Street, Seamore, Walsall, Staffs. Solicitor: W. D. Pinkney, 8, Quay Road, Bridlington.

Industrial Dust & Fumes Extractors, Ltd.—Private company. Registered May 26th. Capital £1,000. Objects: To carry on the business of manufacturers of, and dealers in, rotary blowers, mechanical, electrical and other equipment and appliances, dust and fume extracting and washing and cleaning machines, etc. Permanent directors: I. Kritchefsky (managing director and chairman) and V. V. Dibovsky. Solicitors: H. B. Supperstone & Co., 240, High Holborn, W.C.1.

Companies' Returns

Statements of Capital

Flather & Co., Ltd.—Capital £20,000 in £1 shares. Return dated December 30th, 1940. 13,208 shares taken up. £11,708 paid. £1,500 considered as paid. Mortgages and charges: Nil.

Kartret Switchgear Co., Ltd.—Capital £2,500 in £1 shares. Return dated January 2nd, 1941. All shares taken up £2,500 considered as paid. Mortgages and charges: Nil.

Adelaide Electric Supply Co., Ltd.—Capital £3,625,000 in £2,250,000 preference stock, £750,000 preferred ordinary stock and £625,000 ordinary stock. Return dated December 5th, 1940. All stock taken up. £3,370,000 paid. £255,000 considered as paid. Mortgages and charges: £1,744,200.

Consolidated Electrical Supplies, Ltd.—Capital £100,000 in £1 shares. Return dated December 20th, 1940. Three shares taken up. £3 paid. Mortgages and charges: Nil.

Heatley Electric Forgings, Ltd.—Capital £1,000 in £1 shares. Return dated November 27th (filed December 23rd), 1940. 1,000 shares taken up. £1,000 paid. Mortgages and charges: Nil.

Furness Electrical, Ltd.—Capital £500 in £1 shares. Return dated December 31st, 1940. 430 shares taken up. £119 paid. £311 considered as paid. Mortgages and charges: Nil.

Ferro-Concrete & Electrical Construction Co., Ltd.—Capital £10,000 in 2,500 redeemable preference and 7,500 ordinary shares of £1 each. Return dated January 14th, 1941. 750 preference and 2,700 ordinary shares taken up. £3,450 paid. Mortgages and charges : Nil.

Mullard Wireless Service Co., Ltd.—Capital £10,100 in £1 shares (10,000 "A" and 100 "B"). Return dated January 6th, 1941. All shares taken up. £9,300 paid on 9,200 "A" and 100 "B." £800 considered as paid. Mortgages and charges: Nil.

Bullers, Ltd.—Capital £400,000 in 20,000 5 per cent. cumulative preference shares of £10 each, of which 15,000 have been converted into stock and 20,000 ordinary shares of £10 each, of which 15,593 have been converted into stock. Return dated January 14th, 1941. £150,000 cumulative preference and £155,930 ordinary stock taken up. £150,070 paid. £155,860 considered as paid. Mortgages and charges: £146,857.

Wombwell Electrical Contracting Co., Ltd.—Capital £500 in £1 shares. Return dated December 31st, 1940. 462 shares taken up. £462 paid. Mortgages and charges: Nil.

Electricity Services, Ltd.—Capital £5,000 in £1 shares. Return dated January 2nd, 1941. 4,975 shares taken up. £4,515 paid. £460 considered as paid. Mortgages and charges: Nil.

Stearn Electric Co., Ltd.—Capital £4,000 in £1 shares. Return dated January 14th, 1941. All shares taken up. £2 paid. £3,998 considered as paid. Mortgages and charges : £18,200.

T. Barratt & Co. (Electrical Engineers), Ltd.—Capital £1,000 in £1 shares. Return dated October 1st, 1940 (filed January 18th, 1941). 600 shares taken up. £600 paid. Mortgages and charges : Nil.

Insular Electric Lamp Works, Ltd.—Capital £5,000 in 500 shares of £10 each. Return

dated January 4th, 1941. 100 shares taken up. £20 paid. £980 considered as paid. Mortgages and charges: Nil.

Mortgages and Charges

Mid Cheshire Electricity Supply Co., Ltd.—Satisfaction to the extent of £11,000 on March 31st, 1931, of series of debentures dated December 5th, 1904 (the renewal of which was authorised on June 23rd, 1910), and secured by trust deed dated January 12th, 1905, endorsed on memorandum of July 20th, 1910, and registered July 31, 1910. (Notice filed May 2nd, 1941.)

Companies to be Struck Off the Register

The *London Gazette* of May 27th contains a list of companies whose names will be struck off the Register at the expiration of three months unless cause is shown to the contrary. The list includes the following :—Electric Rollers, Ltd., Eton Electrical, Ltd., Harmonic Radio Co., Ltd., Midwest Radio (Sales & Service), Ltd., Nersun, Ltd., Radioco, Ltd., Radio Signal Co., Ltd., Rentelevision, Ltd., and Scientific Electro-Depositions, Ltd.

Liquidations

Ossicaide, Ltd.—Meetings June 12th at 4, Berners Street, London, W.1, to receive an account of the winding-up by the liquidator, Mr. C. L. Walker.

Bankruptcies

W. N. Bishop, electrical engineer and radio dealer, 39, College Avenue, Maidenhead, Berks.—This debtor's application for discharge was heard recently at the Police Court, Windsor. The bankruptcy proceedings were started in 1939, and the liabilities had been estimated at £726. Proofs lodged, however, totalled £685. The assets had realised £94, and a first and final dividend of 1s. 8¾d. in the £ had been paid. Debtor's representative said that creditors had not been pressing unduly while debtor carried on the business, but in May, 1939, the trade had declined considerably owing to restricted building activities locally. It was then that most of his creditors wanted payment. The discharge was granted subject to two months' suspension.

K. H. Mullinger, electrician, 10, Pitman Avenue, Trowbridge, formerly carrying on business at the Radio Exchange Stores, King Street, Melksham.—Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver, released May 21st.

J. H. Matthews, electrical dealer, 232, Town Street, Bramley, nr. Leeds.—Last day for receiving proofs for dividend June 14th.—Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specifications (1s. *each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.*2.

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19335. "Television receivers." Scophony, Ltd., and F. Okolicsanyi. July 3rd, 1939. (536289.)
22428. "Water heaters and steam generators." Clarkson Thimble Tube Boiler Co., Ltd., and H. J. Fountain. August 2nd, 1940. (536213.)
22531. "Television receivers." Scophony, Ltd., and F. Okolicsanyi. August 3rd, 1939. (536290.)
23545. "Printing equipment." Standard Telephones & Cables, Ltd., G. H. W. Woolley and M. W. Henderson. August 15th, 1939. (536248.)
23883. "Time base circuits." Standard Telephones & Cables, Ltd., D. S. B. Shannon and P. K. Chatterjea. August 18th, 1939. (536215.)
25427. "Time base circuits." Standard Telephones & Cables, Ltd., D. S. B. Shannon and P. K. Chatterjea. September 8th, 1939. (536217.)
26930. "Magnetic compasses." Sperry Gyroscope Co., Inc. October 7th, 1938. (536220.)
26965. "Electronically active alloys." Marconi's Wireless Telegraph Co., Ltd. September 30th, 1938. (536221.)
27303. "Band-pass filters." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust, J. D. Brailsford and E. F. Goodenough. October 5th, 1939. (536171.)
27397. "Direct current amplifiers." Marconi's Wireless Telegraph Co., Ltd. October 7th, 1938. (536292.)
29020. "Automatic clock control for radio receivers." E. A. Davis. October 31st, 1939. (536174.)
29093. "Grounded plate amplifiers." Marconi's Wireless Telegraph Co., Ltd. November 15th, 1938. (536229.)
29243. "Electrical remote indicating systems." E. C. S. Clench, W. Smith and A. R. Thomas. November 2nd, 1939. (536231.)
29315. "Radio compasses, and radio direction finding systems." Standard Telephones & Cables, Ltd., C. W. Earp and R. V. Coles. November 3rd, 1939. (536178.)
29361. "Automatic control mechanism." G. Kent, Ltd., and L. A. C. Bartlett. November 3rd, 1939. (536184.)
29362. "Radio receiving aerial systems." Marconi's Wireless Telegraph Co., Ltd., and J. Stewart. November 3rd, 1939. (536259.)
29472. "Thermostatic electric switches." British Thermostat Co., Ltd., and J. E. Sherlock. November 6th, 1939. (536235.)
29487. "Internal combustion turbine plants." F. A. M. Heppner. November 6th, 1939. (Cognate application, 122/40.) (536238.)
29644. "Electric forging or heating machines." E. Gaspar and Omes, Ltd. November 8th, 1939. (536298.)
29668. "Electro-mechanical friction clutch especially for motor vehicles." Soc. A. Ryba, A.G.L. November 12th, 1938. (536334.)
29747. "Sockets for electric lamps and similar devices." British Thomson-Houston Co., Ltd. November 9th, 1938. (536336.)
30002. "Portable electric light units or apparatus." J. Capo-Bianco. April 5th, 1940. (536340.)
30854. "Adjustable lamp fittings." J. E. Davies. November 27th, 1939. (536342.)
31674. "Governing mechanisms." British Thomson-Houston Co., Ltd. (General Electric Co.) December 7th, 1939. (536242.)
31829. "Electric lamp sockets." British Thomson-Houston Co., Ltd., and F. J. Hawkins. December 8th, 1939. (536273.)
31888. "Illuminating devices." British Thomson-Houston Co., Ltd., R. Maxted and J. Bertram. December 9th, 1939. (536274.)
32129. "Caps for electric lamps." British Thomson-Houston Co., Ltd., and J. Bertram. December 13th, 1939. (536275.)
32212. "Combined electric switches and plug couplings." Walsall Conduits, Ltd., and E. Gough. December 14th, 1939. (536276.)
32611. "A.R.P. street lighting fittings." General Electric Co., Ltd., W. F. S. Debenham and J. B. S. Smyth. December 20th, 1939. (536304.)
33100. "Electromagnetic apparatus." British Thomson-Houston Co., Ltd. December 31st, 1938. (536281.)

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894. "Electric remote control systems employing resonance relays." R. M. A. Smith, G. L. Woolnough, D. R. Price and Metropolitan-Vickers Electrical Co., Ltd. January 15th, 1940. (536284.)
2491. "Washing machines." British Thomson-Houston Co., Ltd. February 11th, 1939. (536309.)
2534. "Modulating system for carrier transmission and the like." Standard Telephones & Cables, Ltd. April 27th, 1939. (536349.)
2542. "Electric motor controllers." Igranic Electric Co., Ltd., and J. R. Taylor. February 9th, 1940. (536310.)
3685. "Electric switchgear." English Electric Co., Ltd., and P. L. Mardis. February 28th, 1940. (536353.)
4270. "Electric induction apparatus." British Thomson-Houston Co., Ltd. March 8th, 1939. (536324.)
4526. "Electrical relays." Westinghouse Brake & Signal Co., Ltd. August 24th, 1939. (536355.)
4821. "Snap action electric switches." A. J. Kelsall and Pye, Ltd. March 14th, 1940. (536357.)
5661. "Electrical testing equipment." Automatic Telephone & Electric Co., Ltd., and W. Saville. March 29th, 1940. (536360.)
6322. "Methods of sealing glass to metal." British Thomson-Houston Co., Ltd. April 7th, 1939. (536362.)
16381. "Light sources, more particularly applicable to searchlights, projectors and the like." K. Marczewski. September 6th, 1940. (Divided out of 11287/40.) (536204.)

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550. "Sockets for electric lamps and similar devices." British Thomson-Houston Co., Ltd. November 9th, 1938. (Divided out of 536336.) (536365.)

Scientific Workers' Meeting

THE annual council meeting of the Association of Scientific Workers was held in Birmingham on May 24th and 25th. Eighty delegates were present, representing scientists and engineers in industrial and Government posts as well as university staff and students. This was the first meeting of the Council to be held since the registration of the Association as a trade union. It was, therefore, natural that the reports which were presented, and the ensuing discussion, should be chiefly concerned with the planning of an industrial policy for the Association which would offer a solution, through trade union activity, to the immediate problems of scientific and technical staffs.

Discussion centred mainly around a report by the Industrial Sub-Committee of the Association which analysed the present conditions of scientific and engineering staff. This report showed that even under peacetime conditions, there was a considerable difference between salaries paid to people having the same qualifications but employed by different firms. Increments were often obtained by negotiation between the employer and the individual scientist or engineer. Because of the wartime restrictions on change of employment, the individual now found that his power to obtain increments was seriously depleted, his chief bargaining instrument having been his ability to seek alternative employment.

Overtime, working hours and holidays were also discussed. In a reference to co-operation with other bodies it was mentioned that the Association has already established friendly relations with the Electrical Power Engineers' Association, the Association of Supervising Electrical Engineers, the National Foremen's Association, the Engineer Surveyors' Association, and the Association of Teachers in Technical Institutes, and a joint committee representative of these organisations has been set up.

STOCKS AND SHARES

TUESDAY EVENING.

POLITICAL developments in the various theatres of war remain the chief factor in Stock Exchange markets. Now that United States has so definitely thrown in its lot with the Allies, the previous feeling of confidence in the ultimate outcome of the war has become strengthened. One result is to be seen in the strength shown by British Government securities, where the popularity of War Weapons Weeks seems to have no effect in restraining purchases of stock upon which the rate of return is a trifle higher than that available from War Loans. Home Railway stocks display no special trend. Industrial shares of all kinds remain very firm. It is easier, in the majority of cases, to sell shares at a satisfactory price than it is to buy them.

Central Electricity

Calculation of the yields on the stocks of the Central Electricity and other boards given in our price lists is worked out at the "flat" rate; that is to say, no allowance is made for possible profit or loss on redemption of the stocks. Taking this into account, the yield on stocks standing at a premium is, of course, reduced; in the case of those priced below par, the yield to redemption is higher than that which is reckoned at the flat rate. As examples, the following quintet of Central Electricity stocks may prove useful, in showing the difference which redemption returns can make to the present-day yield on the money. Following the Stock Exchange practice of working-out the redemption return at the earlier of two dates in the case of stocks quoted at a premium, and at the later of two dates in that of stocks which stand at a discount, here is a brief table showing what the difference is when allowance is made for repayment of the issues at par. In each of the following stocks, a supply is available in the market:—

Interest per cent.	Rdmptn. Date	Interest Dates	Price	Yield	Yield to Rdmptn.
				£ s. d.	£ s. d.
5	1950/70	M. S.	111	4 9 9	3 10 0
5	1955/75	A. O.	113	4 8 3	3 15 3
4½	1951/73	J. J.	108¾	4 3 0	3 10 0
4	1959/89	M. N.	105	3 15 6	3 11 0
3½	1974/94	M. N.	94¼	3 8 6	3 9 6

Siemens Ordinary

A small line of Siemens ordinary shares, which came on offer at 19s. 6d., had not long to wait before finding a home. As already mentioned, anticipation looked for the previously paid dividend of 7½ per cent. to be repeated; on the strength of this, buyers have been giving up to 20s. 9d. for the shares. The dividend announcement will probably be published before this issue of the ELECTRICAL REVIEW, and, if the expected 7½ per cent. is duly declared, the shares should be worth, judged by the standard of comparison with similar shares, something like 22s. 6d. per share. There has been a fair amount of business doing in them during the past week.

Electricity Supply Shares

Edmundsons Electricity Corporation, with a final dividend of 3½ per cent. on its ordinary shares, makes up the rate to 6 per cent. for the year. This is the same dividend as that paid in each of the two preceding years. The price of the shares has improved to 26s., at which the return on the money is £4 12s. 4d. per cent. Clyde Valley ordinary, at 35s., pay £4 11s. 5d. per cent., and of these a thousand are on offer at 35s. 6d. Out of 2,000 Electric Supply Corporation ordinary shares that were offered at 39s. ex dividend, a fair proportion were taken on a yield basis of £5 3s. 0d. per cent. on the money. The price is ⅛ better at 38s. 9d. County of London ordinary at 31s. are on offer as to a thousand shares or so, giving at that price a yield of £5 3s. 3d. Southern Areas ordinary, at 17s. 6d., and Richmond (Surrey) Electric ordinary at a guinea, are obtainable at those prices, and each affords a yield of £5 14s. 3d. per cent. on the money.

Price Fluctuations

Isle of Thanet have moved up to 7s. 6d., gaining the pence. It is announced that the Chancellor of the Exchequer is shortly to meet representatives of the electricity and other utility companies in order to discuss the scope of legislation to be introduced for dealing with war damage to their properties. In the Overseas group, Jerusalem Electric are easier at 18s. 9d., though Palestine Electric "A," at 16s. 3d., have recovered their fall of last week. Whitehall Investment preference hardened to 10s., the speculative buyer being attracted by the high yield on the shares. The meeting of the Marconi Marine Company brought in a few buyers, with the result that the price has stiffened to 23s. 9d. Among the equipment and manufacturing ordinary shares, Johnson & Phillips advanced 2s. 6d. to 45s., on the assumption that the price had rather lagged behind quotations for other shares in companies connected with the same branch of industry. Tube Investments, at 4½, are a few pence harder; Mather & Platt have risen to £2. British Electric Traction deferred is a further ten points to the good at 775, and at 42s. 6d. Thomas Tilling are unchanged on the week.

"Emmies"

Electric and Musical Industries shares have risen 1s. to 9s. as against 7s. 3d., at which they stood a few weeks ago. Rumour sports with the idea that the company is doing well with its bicycle business, and that the remarkable change-over from loss to profit, shown by last year's accounts, will be further accentuated in respect of the current year. The business in records is, according to the same optimistic report, showing satisfactory progress. The accounts will not be out until the late autumn, but the present rise in price shows that speculation in Stock Exchange markets is sluggish rather than defunct.

Two Dividends

The dividend of 7½ per cent. declared on Veritys ordinary shares, comparing with 6 per cent. a year ago, served to arouse inquiries for the 5s. shares, which previously had been standing about 2s. 9d. On the dividend, the price moved up to 3s. 3d., at which, in spite of the advance, the shares are held to be reasonably attractive to the buyer of industrials of this nature.

The United River Plate Telephone Co., which has declared a dividend making 5 per cent., against 4 per cent. for 1939, is controlled by the International Telephone & Telegraph Co. The latter took over the bulk of the United River Plate Telephone ordinary shares some years ago; it is a rare occurrence for these shares to come to market. Their price is approximately £4, at which, if any were to be offered for sale, they would probably find ready purchasers.

Babcock & Wilcox

The market was pleasantly disappointed, as pointed out at the time, by the recent maintenance by Babcock & Wilcox of the 11 per cent. dividend on the company's ordinary shares. In view of the fact that the dividend in the previous year had been earned with a very slender margin, it was thought that the 11 per cent. might undergo a shrinkage and when the announcement was first made that the dividend was again to be 11 per cent., some surprise was expressed at this being possible. The company's figures demonstrate, however, that trading during the past year was sufficiently profitable to enable the dividend to be earned with a comfortable margin, and as a consequence the price retains its recent rise to 41s. 3d. This gives a return on the money of £5 6s. 8d. per cent.

The iron, coal and steel group as a whole is moving upwards. Vickers, for instance, are a few pence better at 15s. 3d. The previous fear of such companies doing less well after the war than they are now, appears to have been thrust into the background, and hopefulness is ready to conclude that companies are to-day making advance preparations for after-war trade when the Allies have won.

The Investor Inquires

It may appear surprising to a good many investors who hold shares in British Insulated, Callender's, Henley's, Reyrolle's, Telegraph Constructon, General Electric, and two or three other companies of kindred character, that the shares at the current market prices should return so comparatively slender a yield as that of 4½ to 5 per cent. on the money. After all, these rates have to be halved when the income tax at 10s. in the £ is taken into account, and people frequently ask why it is that the prices of these shares should stand relatively high, seeing that shares in other industrial companies can be bought at prices that, on present dividend bases, show a much better return on the money. The matter deserves consideration because it affects a wide circle of investment, including not only the private capitalist, but trust companies and others whose principal business is concerned with the employment of money.

The answer to the problem is that the trend of investment turns gradually to stocks and shares of companies which, according to their balance-sheets, as well as for their after-war outlook, stand in a promising position both as regards future prospects and present financial stability. The student of finance closely scrutinises in the first place to-day's balance-sheets with a view to observing the proportion which stock in hand bears to the profit-earning capacity of the company. Then he turns to consideration of the cash position. Companies such as the six named above publish good earnings on the ordinary shares, and are well known to everyone connected with the industry in which they are engaged. After the war, runs the argument, such companies can hardly fail to receive substantial benefit from the reconstruction work that will then become necessary.

Cash Resources

Provided a company has ample cash reserves upon which to rely, its shares nowadays attract more buyers than sellers, and this is the reason why the prices stand, by comparison with many others in the industrial list, at relatively high levels. There may be no share bonus in the immediate future; there may not even be a chance of improvement in the dividend. But for all that the shares just mentioned have come into persistent demand owing to the financial stability of their structure, coupled with the practical certainty that, after we have won the war, their prospects of trade expansion are practically assured of fulfilment.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1941 High-est	1941 Low-est	Dividend Pre-vious	Dividend Last	Middle Price June 3	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole ..	48/6	45/–	15	12½	46/3	..	5 8 3
British Power and Light ..	27/9	23/–	7	6	24/6	..	4 18 0
City of London	22/6	20/–	7½	7	21/3	..	6 11 9
Clyde Valley	36/6	33/6	8	8	35/–	..	4 11 5
County of London.. ..	34/6	30/–	10½	8	30/–	..	5 6 8
Edmundson's:							
7% Pref.	31/–	25/6	7	7	30/9	..	4 11 1
Ord.	26/–	23/6	6	6	26/–	+6d.	4 12 4
Elec. Dis. Yorkshire ..	39/–	36/–	9	9	38/9	..	4 12 9
Elec. Fin. and Securities ..	40/–	29/–	12½	12½	40/–	..	6 5 0
Elec. Supply Corporation..	39/–	36/–	11½	10	38/9	+⅛	5 3 3
Isle of Thanet	8/–	6/–	2	Nil	7/6	+6d.	—
Lancs Light and Power ..	31/6	28/6	7½	7½	31/3	..	4 16 0
Llanelly Elec.	21/–	19/6	5½	5½	20/–	..	5 10 0
Lond. Assoc. Electric ..	16/6	12/6	5½	4½	15/9	..	5 14 3
London Electric	23/6	21/3	7	7	22/6	..	6 4 5
London Power Deb. Red ..	105½	102	5	5	103	..	4 17 1
Metropolitan	34/6	31/–	10	8	31/3	..	5 2 3
Midland Counties	35/6	32/9	8	8	35/–	..	4 11 5
Mid. Elec. Power	35/–	33/3	9	9	35/–	..	5 2 10
Newcastle Elec.	26/3	24/6	7	7	25/–	..	5 12 0
North Eastern Elec.:							
Ordinary..	29/–	25/6	7	7	27/6	..	5 1 10
7% Pref...	32/6	29/–	7	7	32/6	..	4 6 2
Northampton	2⅛	39/6	10	10	41/3	..	4 17 0
Notting Hill 6% Pref.(£10)	9	8	6	6	8½	..	—
Northmet Power:							
Ordinary..	34/6	28/6	10	7	28/9	..	4 17 4
6% Pref...	29/6	27/3	6	6	29/6	..	4 1 4
Richmond Elec.	20/–	18/–	6	6	18/9	..	6 8 0
Scottish Power	36/6	33/–	8	8	36/3	..	4 8 5
Southern Areas	16/6	14/6	5	5	16/3	..	6 3 0
South London	20/–	19/3	7	7	20/–	..	7 0 0
West Devon	21/6	20/9	5	5	21/3	..	4 14 1
West Glos.	18/3	17/3	4½	4½	17/6	..	5 2 10
Yorkshire Elec.	38/3	34/6	8	8	38/3	..	4 4 0
Overseas Electricity Companies							
Atlas Elec.	2/6	1/6	Nil	Nil	2/–	..	—
Calcutta Elec.	37/3	33/–	8*	7*	36/–	..	3 17 8
Cawnpore Elec.	30/–	26/–	10	10	28/9	..	7 5 9
East African Power ..	25/6	21/6	7	7	25/–	..	5 12 0
Jerusalem Elec.	22/6	18/6	7	7	18/9	−⅛	7 9 4
Kalgoorlie (10/–)	12/6	11/–	7½	7½	12/6	..	6 0 0
Madras Elec.	25/3	23/6	8*	6*	23/9	..	—
Montreal Power	31	24	1½	1½	25	..	6 0 0
Palestine Elec. "A" ..	20/6	15/–	Nil	Nil	16/3	+1/9	—
Perak Hydro-electric ..	18/3	16/3	2½	6	16/3	−⅛	7 7 8
Shawinigan Power ..	18½	15	83cts.	90cts.	15	..	—
Tokyo Elec. 6%	40½	36	6	6	36½	..	16 9 0
Victoria Falls Power ..	76/6	69/6	15	15	73/9	..	4 1 4
Whitehall Investment Pref.	14/9	8/3	7½	7½	10/–	+⅛	15 0 0
Public Boards							
Central Electricity:							
1950–70	110½	108	5	5	110½	..	4 10 6
1955–75	113½	109½	5	5	113	..	4 8 6
1951–73	108	105½	4½	4½	108	..	4 3 4
1963–93	101	94	3½	3½	100	..	3 10 0
1974–94	94	87⅞	3½	3½	94	+1	3 9 2
London Elec. Trans. Ltd.	94	91½	2½	2½	94	..	2 13 2
London & Home Counties							
1955–75	108	106	4½	4½	108	..	4 3 4
Lond. Passenger Transport:							
A	120	109	4½	4½	118½	−1	3 16 0
B	114	102½	5	5	113½	+1	4 8 0
C	36	29	1½	3	31	..	9 13 6
West Midlands Joint Elec.							
1948–68	108	103	5	5	107½	..	4 13 0
Telegraph and Telephone							
Anglo-Am. Tel:							
Pref.	103½	99	6	6	103½	..	5 16 1
Def.	24	21	1½	1½	22½	..	6 13 4
Anglo-Portuguese	17/6	12/6	8	8	12/6	..	12 16 0
Cable & Wireless:							
5½% Pref.	102	93	4½	5½	100	−½	5 10 0
Ord.	68	52½	4	4	66½	+1½	6 0 3
Canadian Marconi $1 ..	5/–	4/–	Nil	4cts.	5/–	..	3 4 0
Globe Tel. & Tel.:							
Ord.	29/–	26/–	7½*	6*	27/6	..	4 7 3
Pref.	27/6	25/–	6	6	27/6	..	4 7 3
Great Northern Tel. (£10)..	14	10½	20	20	12½	..	—
Inter. Tel. & Tel.	3½	2½	Nil	Nil	3	..	—
Marconi-Marine	23/–	19/9	7½	7½	23/9	+⅛	6 6 4
Oriental Telephone Ord. ..	55/6	47/–	12*	11½*	2	..	4 1 10
Telephone Props.	11/6	11/–	6	6	11/3	..	10 13 4
Telephone Rental (5/–) ..	7/9	6/9	10	10	7/3	..	6 18 0

Company	1941 High-est	1941 Low-est	Dividend Pre-vious	Dividend Last	Middle Price June 3	Rise or Fall	Yield £ s. d.
Traction and Transport							
Anglo. Arg. Trams:							
First Pref. (£5)	2/3	1/–	Nil	Nil	2/–	..	—
4% Inc.	8½	4	Nil	Nil	4½	..	—
British Electric Traction:							
Def. Ord.	830	740	45	45	775	+10	5 16 2
Pref. Ord.	167	150	8	8	60	..	5 0 0
Bristol Trams	40/–	36/–	8*	8	36/3	..	4 8 5
Brazil Traction	8	6½	$1	50c.	7	..	—
Calcutta Trams	19/9	18/–	8	5½	18/–	..	6 2 3
Cape Elec. Trams	17/6	16/6	5	5	17/–	..	5 17 4
Lancs Transport	39/9	36/–	10	10	38/9	..	5 3 1
Mexican Light:							
1st Bonds	40	34½	5	5	40	..	—
Rio 5% Bonds	85½	82½	5	5	85	..	5 17 8
Southern Rly.:							
5% Prefd.	53½	43½	5	5	50½	..	9 18 0
5% Pref...	94	77⅛	5	5	93½	..	5 7 0
T. Tilling	43/6	34/6	10	10	42/6	..	4 14 0
Tilling & B.A.	48/–	45/6	8*	7*	45/9	..	3 1 2
West Riding	36/–	34/–	10	10	36/–	..	5 11 1
Equipment and Manufacturing							
Aron Electricity Ord. ..	18/6	16/–	15	Nil	17/6	—	—
Assoc. Elec.:							
Ord.	41/–	38/3	10	10	40/–	..	5 0 0
Pref.	36/–	33/3	8	8	35/–	..	4 11 5
Automatic Telephone & El.	47/3	32/–	12½	12½	41/3	..	6 1 1
Babcock & Wilcox ..	43/3	39/–	10	11	41/3	+⅛	5 6 8
British Aluminium ..	43/6	39/–	12½	10	40/9	+9d.	4 18 1
British Insulated Ord. ..	88/3	78/9	20	20	82/6	..	4 17 0
British Thermostat (5/–) ..	12/6	10/6	18½	18½	12/6	..	7 8 0
British Vacuum Cleaner(5/-)	6/3	6/–	40	12½	6/3	..	10 0 0
Brush Ord.	4/3	3/6	Nil	Nil	4/–	..	—
Callender's	65/6	58/6	15	15	61/3	..	4 17 9
Chloride Elec. Storage ..	63/6	60/–	15	15	62/6	..	4 15 10
Consolidated Signal ..	65/–	60/–	17	17	62/6	..	5 8 7
Crabtree (10/–)	24/–	21/3	17½	17½	23/9	..	7 7 4
Crompton Parkinson:							
Ord. (5/–)	19/–	17/9	30	20	18/9	..	5 6 8
E. K. Cole (5/–)	4/9	2/9	10	Nil	4/6	..	—
Elec. & Musical Industries (10/–)	9/–	7/3	5	Nil	9/–	+1/–	—
Electric Construction ..	27/6	25/–	13½	10	27/6	..	7 5 6
Enfield Cable Ord. ..	51/–	45/–	16½	12½	45/–	..	5 11 3
Electrical Switchgear (10/-)	22/6	20/–	16	10	20/–	..	5 0 0
English Electric	31/6	29/–	10	10	31/3	..	6 8 0
Ensign Lamps (5/–) ..	16/3	15/–	25	25	15/–	..	8 6 3
Ericsson Tel. (5/–) ..	37/3	35/–	25*	22*	35/–	..	3 2 10
Ever Ready (5/–)	27/6	25/–	40	40	27/–	..	7 8 0
Falk Stadelmann	16/9	13/9	6	7	15/9	..	8 17 10
Ferranti Pref.	25/6	23/6	7	7	25/–	..	5 12 0
G.E.C.							
Pref.	33/–	30/6	6½	6½	32/6	..	4 0 0
Ord.	83/–	77/–	20	20	82/6	..	4 17 0
Greenwood & Batley ..	21/–	18/6	15	13	20/–	..	13 0 0
Hall Telephone (10/–) ..	14/–	10/–	15	10	13/9	+⅛	7 5 6
Henley's (5/–)	21/6	19/6	20	20	20/–	..	5 0 0
4½% Pref.	21/6	20/–	4½	4½	21/3	..	4 4 8
Hopkinsons	43/–	37/6	15	15	42/6	+6d.	7 1 2
India-Rubber Pref. ..	21/6	19/6	5½	5½	21/3	..	5 3 6
Intl. Combustion	92/6	81/3	32½	30	92/6	..	6 13 4
J. Lucas	59/–	50/6	15	15	58/9	..	5 2 0
Johnson & Phillips ..	48/3	43/–	15	15	45/–	+½	6 13 4
Lancashire Dynamo ..	53/6	50/–	20	20	52/6	..	7 12 5
Laurence, Scott (5/–) ..	10/–	7/6	15	15	9/3	+3d.	8 2 2
London Elec. Wire ..	25/6	20/–	7½	7½	22/6	..	6 13 4
Mather & Platt	37/9	32/–	13½	10	40/–	+⅛	5 0 0
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	..	5 3 6
Murex	84/6	75/–	20	20	82/6	..	4 7 0
Pye Deferred (5/–) ..	11/6	10/9	25	25	11/3	..	11 2 2
Revo (10/–)	21/3	18/9	17½	5	21/3	..	2 7 0
Reyrolle	52/6	47/9	12½	12½	52/6	..	4 15 6
Siemens Ord.	20/9	17/–	7½	7	20/–	..	7 10 0
Strand Elec. (5/–) ..	2/–	1/–	4	2	2/–	..	5 0 0
S. Smith (1/–)	7/9	5/9	37½	50	6/3	..	8 0 0
Switchgear & Cowans (5/–)	9/–	7/3	10	15	8/9	..	8 11 6
Telegraph Condenser (10/–)	12/6	7/–	Nil	5	12/6	..	4 0 0
Telegraph Construction ..	39/–	34/6	10	10	40/–	..	5 0 0
Telephone Mfg. (5/–) ..	7/6	6/9	9	9	7/3	..	6 4 2
Tube Investments.. ..	92/6	89/–	23½	23½	90/–	+6d.	5 5 6
Vactric (5/–)	2/3	2/–	4	Nil	2/–	..	—
Vickers (10/–)	16/–	14/–	10	10	15/3	+3d.	6 11 4
Ward & Goldstone (5/–) ..	19/9	12/6	20	20	16/6	..	5 19 9
Westinghouse Brake ..	42/6	39/6	17½	10	40/9	..	4 18 1
Walsall Conduits (4/–) ..	26/6	24/6	55	55	26/3	..	8 7 6
West Allen (5/–)	4/3	3/6	7½	7½	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Tenders Invited and Accepted. Schemes Promising Electrical Work.

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Birmingham.—June 25th. Electric Supply Department. Motor-driven air compressor, etc., for the Hams Hall "B" power station. (See this issue.)

Burnley.—June 16th. Electricity Department. Duplicate bus-bar compound filled e.h.v. switchgear and e.h.v. cables. (See this issue.)

Coventry.—June 10th. Transport Committee. Conversion of existing DC lighting and power equipment in offices, garages and depot buildings to AC supply. Conditions, specification and form of tender from R. A. Fearnley, general manager and engineer, Harnall Lane East. Tenders to the chairman, Transport Committee, Transport Head Office, Harnall Lane East.

Hastings.—June 18th. Corporation. Boiler fuel for the period July 1st, 1941, to June 30th, 1942. (See this issue.)

South Africa.—DURBAN.—City Council. June 20th. Lightning arrestors, pole fuses, l.v. insulators, enamelled shades and sodium vapour lamps. Battery charging plant and electrical test bench.

July 4th. Five 15-kVA transformers.

PORT ELIZABETH.—City Council. July 24th. Cable, copper wire and house service cut-outs.

Orders Placed

Falkirk.—Corporation Electricity Committee. Accepted. Fan and grit extraction plant. (£1,605).—James Howden & Co., Ltd.

Glasgow.—Electricity Committee. Accepted for twelve months. Insulating tapes.—Ioco Rubber & Waterproofing Co.; British Insulated Cables; City Textile Co.; Henley's; and James North Hardy & Son. Meters.—Sangamo Weston; Metropolitan-Vickers Electric Co.; Measurement; English Electric Co.; Aron Electricity Meter; Electrical Apparatus Co.

Police Committee. Accepted for six months. Electrical fittings and accessories.—British Electrical & Mfg. Co.; Revo Electrical Co.

Southport.—Gas Committee. Accepted. Electric detarrer for the gasworks (£3,520).—Whessoe Foundry & Engineering Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnsley.—Day nurseries, site adjoining New Street Clinic, and adaptation of 43, Gawber Road, and public shelter at Kendray Hospital, for T.C.; H. Taylor, borough engineer, Town Hall.

Chester.—Youth camp, Park Arthur, near Mold; Education Committee.

Out-patients' department and reconstruction of the boiler house at the Royal Infirmary; the secretary, Chester Royal Infirmary, St. Martin's Fields.

Reinstatement of 26 houses near the Town Hall for T.C.; C. Greenwood, city surveyor, Town Hall.

Droylsden.—Communal feeding centre at the Co-operative Hall, Market Street, for U.D.C.; F. Schofield, Council Offices, Manchester Road.

Enfield.—Fire personnel accommodation (£3,500); U.D.C. surveyor.

Glasgow.—Temporary school, Peat Road, Househillwood; R.C. Archdiocese of Glasgow.

Gravesend.—Additions, mineral water factory, Shrubbery Road; H. L. Smith.

Great Barrow.—Rebuilding sanatorium with 50 beds and erecting 50 chalets at Barrowmore Hall; the Secretary, East Lancs Tuberculosis Sanatorium and Settlement, Barrowmore Hall.

Jarrow-on-Tyne, co. Durham.—Houses (12) for T.C.; borough surveyor, Town Hall, Jarrow.

Ludlow.—Community feeding centre for T.C.; Stott & Co., Ltd., 32, Paradise Street, Birmingham, 1.

Macclesfield.—Buildings and machinery for the Waterworks Committee; H. Lapworth Partners, engineers, 25, Victoria Street, London, S.W.1.

North Shields.—Store, King Street, for H. D. Burton, Ltd.; J. W. Wallace, architect.

Openshaw.—Works extensions; R. B. Key, builder, Hyde Road, Woodley, Cheshire.

Pendleton.—Repairs to the Junior School, Chaseley Fields (£800), for Board of Governors; secretary, Pendleton High School for Girls, Eccles Old Road.

Stanley.—Cooking centres, Lingwell Gate Lane, and the Billiards Hall, and cash and carry centres at Stanley and Wrenthorpe, for U.D.C.; surveyor, Council Offices, Coach Road, Outwood, Lofthouse Gate.

Swinton and Pendlebury.—Installation of electric lighting in 64 public shelters and erection of electric illumination direction signs for shelters for the T.C.; H. C. Busbridge, borough electrical engineer, Town Hall.

Tynemouth.—Store house for Hastie D. Burton, Ltd., builders and contractors, King Street, North Shields.

Repairs, Assistance Institution (£9,150); borough engineer.

Wallsend.—Community feeding centre (£1,965), Stephenson Memorial School, for T.C.; C. E. Bradbury, town clerk, Town Hall.

Canteen for Wallsend Slipway & Engineering Co., Ltd.; Cackett, Burns, Dick & McKellar, 21, Ellison Place, Newcastle-on-Tyne.

All in a Night's Work

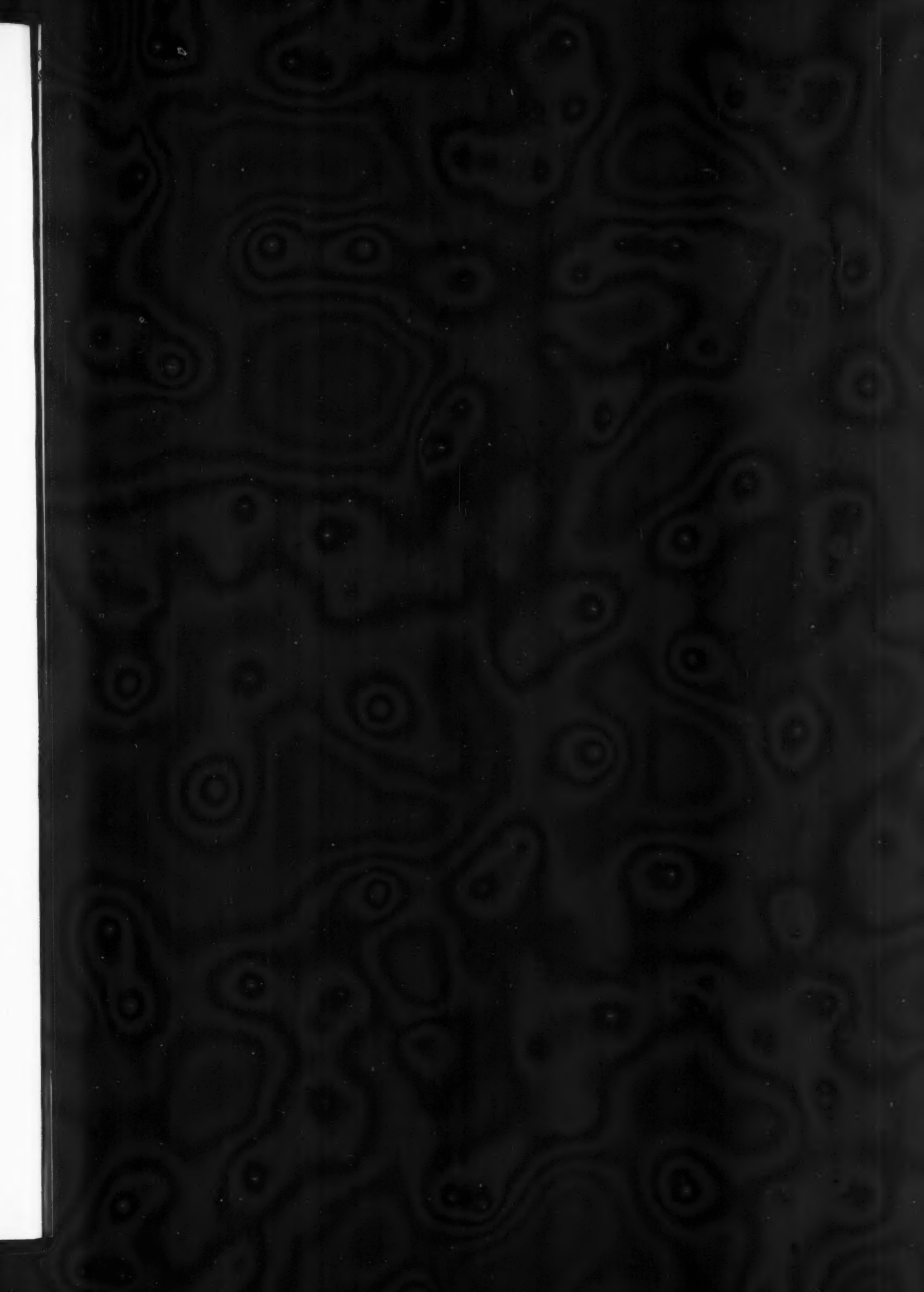
A Typical Report from a London Power Station

ENGINEERS on night duty in London power stations cannot complain that their lives are uneventful nowadays. Little is told of the exciting and dangerous experiences they now have to go through in the course of their normal duties. They themselves, in fact, are becoming so accustomed to the life that they scarcely consider the matter worth comment. It was, indeed, just chance which resulted in our being in one engineer's office when he was making the following report, which, it is emphasised, is not an isolated instance but typical of many similar nights' work during heavy raids.

On the evening in question a high-explosive bomb dropped near the electricity works and this was followed immediately by a shower of incendiary bombs, which fell in the roads adjoining the works. None of these bombs appeared to fall on to the Electricity Department's buildings, but the watchman operated the works fire alarm system to call all available men. Men were on various duties in the station, control room, switchhouse basement and watchman's office, and they all rushed to deal with the ignited bombs, but at this instant another H.E. bomb dropped nearby, followed immediately by a second shower of incendiaries, which were scattered among the various station buildings. Bombs falling at various vulnerable spots were dealt with instantly.

At the same time a number of fire bombs dropped near another of the Electricity Department's stations, these being dealt with by the station staff. In the meantime several H.E. bombs were dropped in the locality, and all men concerned had to fall flat on these occasions. By this time the flames from a nearby fire were sweeping over the station outbuildings. Fumes filled the station, and breathing was difficult. The stand-by engineer and the coal attendant had then returned to the station after dealing with the incendiaries and were standing by the main doors when an H.E. bomb fell on the other side of the railway.

Although due to an external failure there was no supply for the auxiliaries, the chief engineer gave instructions for the second mentioned station to be restarted with No. 2 set on atmosphere. Actually, this is the first time this station has been started up without auxiliary supplies, and it speaks well for the station staff under the control of the charge engineer that it was achieved under very trying conditions during the blackout. Incidentally the failure of the supply stopped the pumps which supplied the cooling tower pond, which was being used by the Fire Brigade for water supply. Thus as soon as the supply became available the pumps were restarted and after a short interval water was pumped from the canal.

The turbine started on atmosphere was switched on to the busbars and the steam pressure was down to 120 lb. (normal pressure 300 lb.) but power was available at the other station. E.h.v. outgoing feeders to converting stations were switched in and supplies were restored in a short time to all available DC feeders except those in badly damaged areas. Supplies were also given to a neighbouring borough for energising the auxiliaries and to enable it to start up its turbo-alternator, and so restore its supplies. A letter of appreciation in this connection was received from Mr. J. N. Waite, manager of the South East and East England District of the Central Electricity Board.

It is to be noted that the work carried out in restoring supplies was done under very arduous conditions. Owing to blast, a large amount of the blacking out was useless, and thus only light from torches could be used. A nearby fire was raging throughout the night while telephone communication with manually operated substations was interrupted, necessitating personal visits by the engineer standing by. The faults on the outside network further complicated the work of restoration. The men concerned are worthy of every praise, particularly the firemen.